the A.P.I. PREVIEW

OIL AND GAS JOURNAL

OUR GUARANTEE

If in competitive tests, your Mission equipment does not prove more economical and dependable than any other make you are now using, the entire purchase price will be promptly refunded.

For over a quarter century, every product that Mission has offered the oil industry has more than lived up to this guarantee. That's why operators all over the world depend on Mission for maximum performance under all conditions. It's reason, too, for you to always specify Mission to your supply store. They're available everywhere.

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COST INCREASES—

June 1953 vs. December 1947

"What else need be said?"

CEMENTING

HALLIBURTON

OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

the OIL AND GAS JOURNAL

NOVEMBER 9, 1953 VOL. 52 NO. 27

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In Brief . . .

1. REPRESSURING WITHOUT GAS . . . A shortage of natural gas led to the use of nitrogen as a repressuring agent in an oil reservoir. All indications are that the nitrogen acts substantially the same as would natural gas in displacing the oil and increasing the ultimate recovery from this Wyoming reservoir. Operated in conjunction with a sulfur-recovery plant, the inert-gas generation and injection proves to be economical and successful.

2. GREAT EXPECTATIONS . . . Besides a basically sound knowledge of his profession, industry expects the technical employe to be: (1) Cooperative, willing and ready to do what is asked of him; (2) open minded, ready to listen to and take advice from his superiors, and to give full consideration to others; (3) congenial, able to get along with his fellow employes, but without lowering his own moral standards; (4) inquisitive, with a keen desire to know the reason for things and to look beyond what is required; and (5) neat, both physically and mentally.

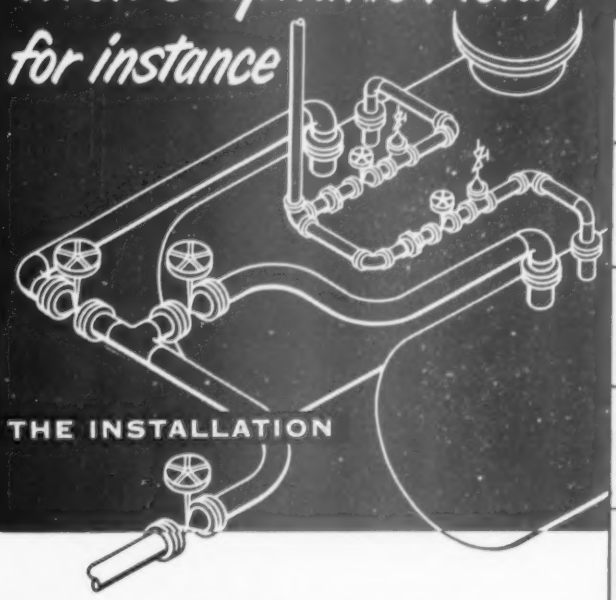
3. EASY CASING CALCULATIONS . . . A graphical solution for casing collapse change points does away with the complex and slow mathematical solutions of the past. The illusive change points associated with combination weight casing strings may be found easily with a triangulation method that makes use of conventional curves of the variation of collapse resistance and tensile load.

4. ECONOMICAL ENGINES . . . Comparative operating costs for trifuel, dual-fuel, and diesel engines used on pipe-line pumping applications show for an average load of 1,000 hp. that: (1) Use of trifuel engine results in savings of more than $2,000 per year over the dual-fuel engine, and (2) use of the trifuel engine results in savings of more than $30,000 per year over the straight diesel engine.

5. MORE OIL NEEDED . . . Atomic energy is not a threat in the immediate future to our energy markets; rather in the next decade or two it may gradually supplement the uses of oil and gas. It seems safe to predict that the oil industry will be called upon to supply ever-increasing energy needs of the United States for some time to come. The industry in turn will be looking to its geologists to increase the supplies of crude oil and gas.

Model Behavior for Steel Valves

...on Sulphuric Acid, for instance



THE INSTALLATION

At a leading Gulf Coast lube oil plant, using Crane steel valves on lines to concentrated sulphuric acid storage and blow cases.

VALVE SERVICE RATINGS

SUITABILITY:	Giving full satisfaction
FEATURES:	Compact bolted-bonnet design
MAINTENANCE COST:	Routine service only needed
SERVICE LIFE:	In lines more than 2 years
OPERATING RESULTS:	Safe control of acid—no loss
AVAILABILITY:	Catalog item—No. 3607X

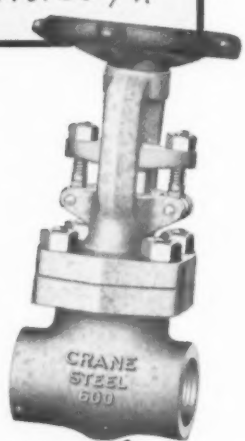
THE CASE HISTORY

Valves formerly used in this service showed severe corrosion a few months after installation. Both stems and seats were affected, with early leakage resulting. Longest life of any of these valves was less than one year.

Replacement was made more than 2 years ago with Crane No. 3607X steel gate valves. By effectively sealing against atmospheric condensation, the deeper Crane stuffing box prevented dilution of acid and resultant stem corrosion. Wider seating surfaces give Crane valves higher resistance to seat corrosion and leakage. They're still in service; show no loss of efficiency. That's the result of thrifty buying—when quality is the first consideration.

THE VALVE

You'll find big valve features in these Crane 600-pound bolted bonnet, small steel gates. They fill every need for quality, compact design, maximum strength with no excess weight. Easy to use; easy to service. Sizes, ½ to 2 in.; screwed, flanged, or socket-welding ends. See your Crane catalog or your Crane Representative.



THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

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How to INCREASE BOILER RATINGS with your present furnace and stack

Coppus-Dennis FANMIX Burners Give You More Heat with No Other Major Change in Equipment

Coppus-Dennis **FANMIX** Burners give you *perfect* mechanical mixing of fuel and air *at the burner outlet . . . instantaneous* ignition close to the burner . . . and *complete* combustion *without visible flame* when burning natural gas. No other burner combines these three advantages.

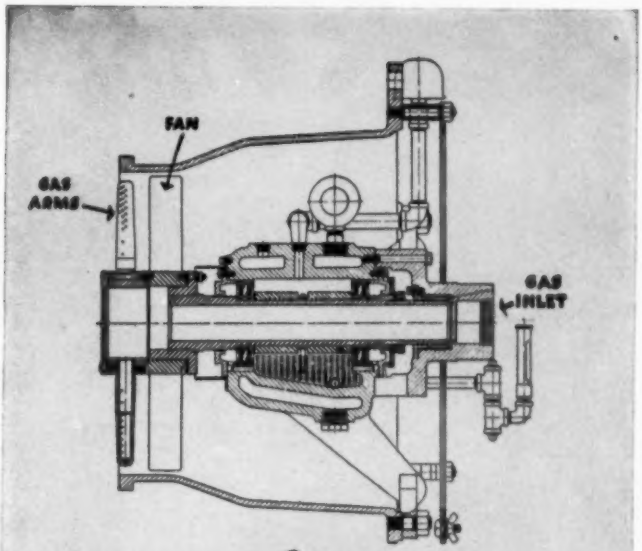
Because **FANMIX** delivers the *right* mixture of fuel and air *without blow-torch action*, all of your furnace space is used for combustion . . . *none for mixing*. That's why your present furnace can release more heat . . . why new installations can get more heat out of smaller furnace space.

Because **FANMIX** can be guaranteed to secure complete combustion of natural gas *with less than 5% excess air*, you get uniform "radiant heat" *without drifting hot spots*. That's why a **FANMIX**-fired furnace seldom varies in temperature more than 5% over its entire area.

WRITE FOR ALL THE FACTS

When you see in Bulletin 410–6 how fuel escaping from orifices in rotating driver arms rotates the fan to draw the correct proportion of air into the path of the fuel at right angles . . . how **FANMIX** creates its own forced draft, reduces stack requirements, prevents cracking of "wet" gas . . . how two **FANMIX** types handle either gas or oil or any combination of both — you'll understand why **FANMIX** Burners have such wide acceptance in oil refineries and power plants.

Send for the Coppus-Dennis **FANMIX** Bulletin 410–6. Coppus Engineering Corporation, Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG, and REFINERY CATALOG.



ANOTHER
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SERVICE

that is saving dollars...

IN RECONDITIONING customer's pumps at "Oilwell's" Odessa, Texas, pump shop, old balls and seats are carefully checked for accuracy of mating under vacuum.

COMPLETELY NEW "Oilwell" pumps are custom assembled to meet the requirements of individual wells. Similar assembly practices are followed in reconditioning customer's pumps, regardless of make.

...for MORE and MORE Operators of Production Leases

METICULOUS CARE is a priceless ingredient in the services which "Oilwell's" Modern Subsurface Pump Shops are equipped to perform for operators of production leases.

This METICULOUS CARE assures the same high-precision exactness in the assembly of every new "Oilwell" pump—DI-HARD, HI-BRIN, CHROM-OLY-HARD, NICKEL-IRON or SILVERLINE—that went into its manufacture. The correct combination of component parts can now be selected to build the style of pump required to meet specific conditions in each individual well—with proper contact stroke length, plunger working clearance, number and type of balls and seats and the quality and type of all accessary items. This makes each new "Oilwell" pump a custom-assembled job.

This same METICULOUS CARE results in additional economies in the routine servicing of customer's pumps, when reconditioning work is done in "Oilwell" shops. Complete stocks of A.P.I. parts, plus factory-approved equipment and facilities, enable "Oilwell's" skilled subsurface pump specialists to return worn pumps to original efficiency and greatly increase their service life.

Why Not Visit . . . a local "Oilwell" Subsurface Pump Shop and discuss with the production equipment specialist there, your immediate pump problems?

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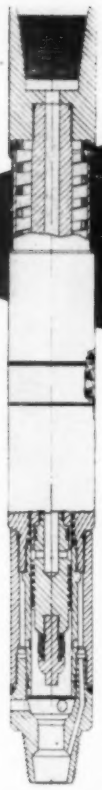

16,000 FEET

DON'T FAZE HALLIBURTON'S NEW HYDRO-SPRING TESTER

Nothing has stopped this testing tool, not even the super-deep holes. To date, Hydro-Spring has performed perfectly in most every oil field, under all conditions, at depths from 700' to 16,500'—and right on the first run every time!

Think how much this could save you in trouble, time, and money. You won't be the first who found it out, thousands more have made the swing to Halliburton's Hydro-Spring, so don't be the last to set the old way aside.

Several important features account for Hydro-Spring's success:

1. Opens easily by slacking off weight of drill pipe.
2. Positive indication at surface when tool opens.
3. Packer expands for definite time before tester opens.
4. Combination tool requires fewer assemblies.
5. Locked open by-pass aids in easy, rapid descent of string and helps eliminate formation and packer damage.
6. Initial Hydrostatic mud weight easily read.

Ask around, you're sure to find an operator handy who has run a Hydro-Spring test. And he'll gladly tell you what it's done for him. Then call your nearby Halliburton representative who'll be on the walk with his string made up before you come out of the hole. Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

Hydro-Spring Tester — Patent Applied For

HALLIBURTON

"YEARS AHEAD IN DRILL STEM TESTING"

WANT TO TAKE A DARE?

Here's a challenge to any owner of any competitive machine.

Your Caterpillar Dealer will demonstrate any Caterpillar-built machine against any competitive unit . . . and he'll do it on your job.

He'll do it—not with a chip on his shoulder—but to show you that a Caterpillar-built machine will do your job better, with more production in less time and for a longer period without down time that costs you money in time and repairs.

If you own Cat* equipment you know it will do these things. If you're using another make, here's your chance to find out whether or not you're getting your money's worth.

If you've never used Caterpillar equipment on your job our dare gives you a chance to compare the working ability of Cat machines with others.

Take the dare . . . get a demonstration . . . any way you look at it, you'll be the winner.

Call your Caterpillar Dealer and say, "Yes, I'll take your dare." Tell him where and when. He'll do the rest.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

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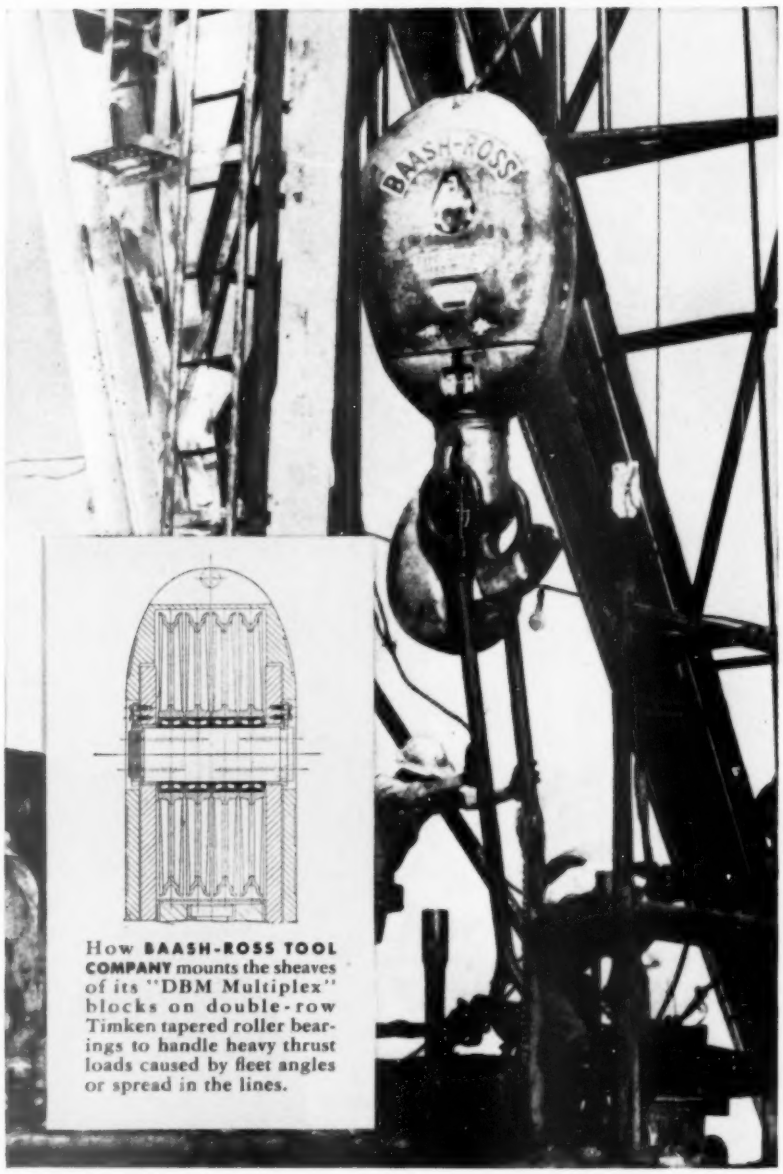
NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Gains or loses 1250 pounds without changing its shape, runs free on TIMKEN® bearings



How **BAASH-ROSS TOOL COMPANY** mounts the sheaves of its "DBM Multiplex" blocks on double-row Timken tapered roller bearings to handle heavy thrust loads caused by fleet angles or spread in the lines.

GAINING weight is no problem for Baash-Ross Tool Company's "DBM Multiplex" blocks. And it's easy to take off, too. Pockets built into the sides of the block can be filled with a lead weight—the one in the picture will take as much as 1250 pounds — without adding loose parts, or changing the streamlined contour. As a result, blocks can be made to fall faster to increase the efficiency of the rig.

To handle the heavy thrust loads set up by fleet angles or spread in the lines, each sheave in Baash-Ross "DBM Multiplex" blocks is mounted on double-row Timken® tapered roller bearings. Because they are *tapered,* Timken bearings can take heavy thrust loads as well as radial loads. The bearings locate the sheaves positively, keep running free regardless of line load or lead.

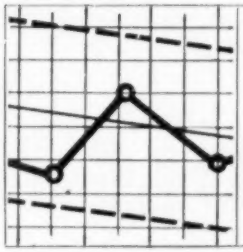
No other bearing gives you all the advantages of Timken *tapered* roller bearings. Specify them for the oil field equipment you build or buy. Always look for the trademark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



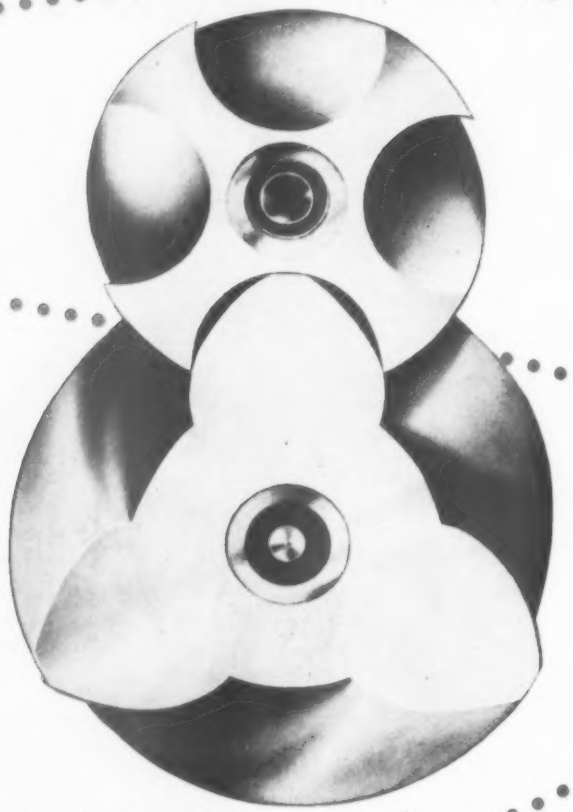
STATISTICAL QUALITY CONTROL

To insure uniform high quality and closer tolerances, the Timken Company uses statistical quality control. With it, tolerance deviations are plotted graphically. It's one of industry's newest, most scientific methods of improving product uniformity.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST →○← LOADS OR ANY COMBINATION ↓→○←

Smooth Continuous Delivery

at all speeds



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- **Unaffected by fluid surges and shocks**
- **No vibration to cause wear or fatigue**
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- **Complete static and dynamic balance**
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Write for Pipe-Line Metering Bulletin No. 634

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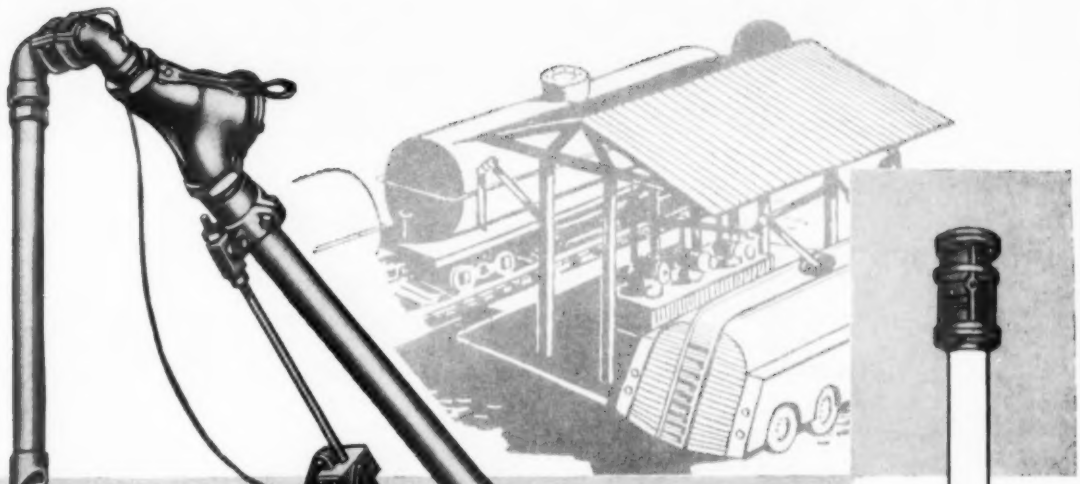

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EXTREME RANGE

No. 2750

transport loading assembly

Minimum fill up time . . . no truck respotting . . . at loading racks where OPW's No. 2750 Transport Loading Assemblies are installed. The extreme range, overall compactness, and maneuverability makes the difference . . . provides a really effortless, flexible loading of tank cars and trucks.

Convenient to operate. No cumbersome counter-weights. Less mass to be started, moved, stopped. Loader controls elevation from truck by remote control cable. Arm locks in any position, elevates automatically when locking mechanism is released by operator. No valving mechanism, gaskets or piston leathers to wear. Unaffected by changes in temperature or climate.

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Sizes: 3", 4"

Riser supported by two bronze or steel straight through flanged double ball bearing swing joints.

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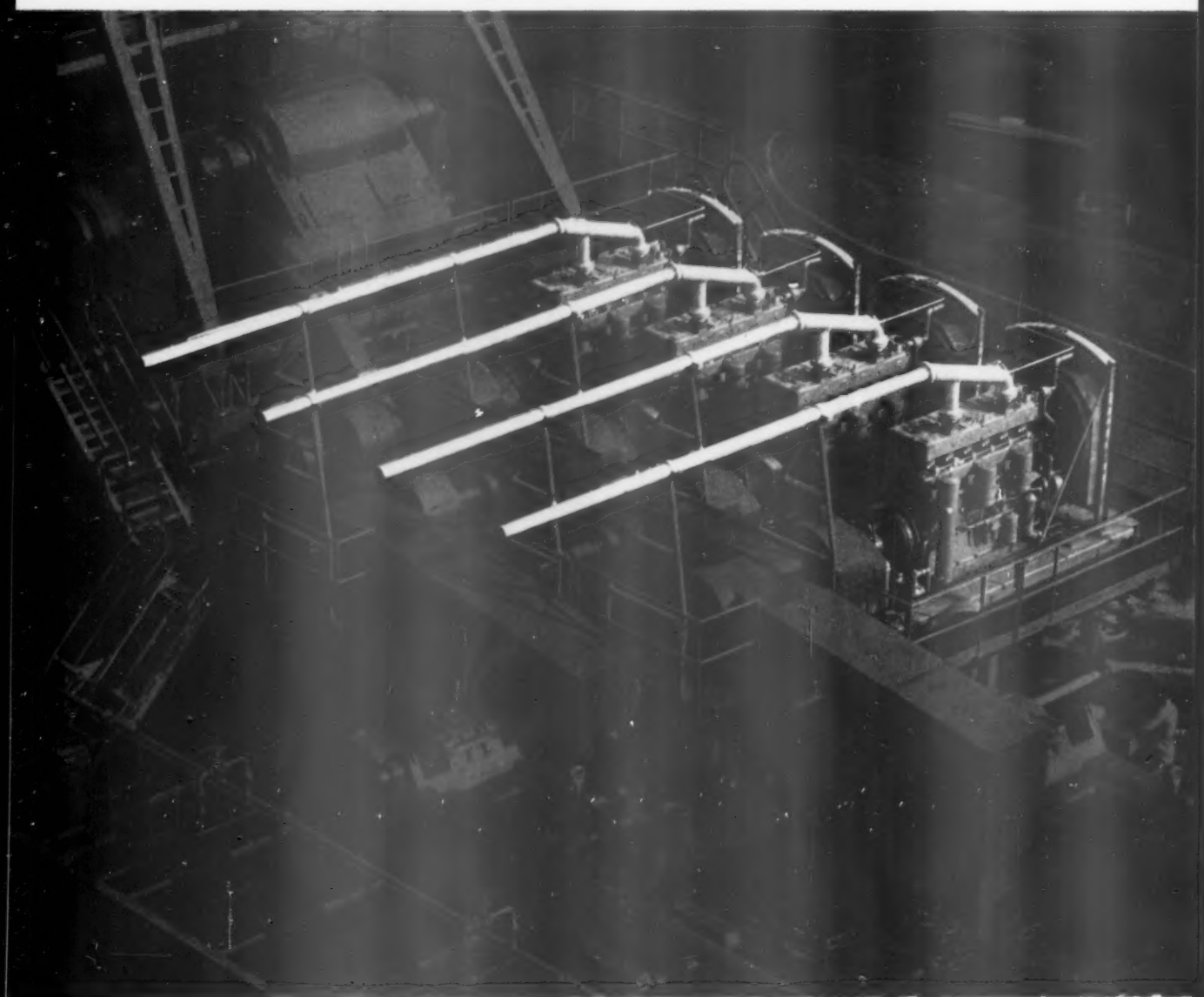
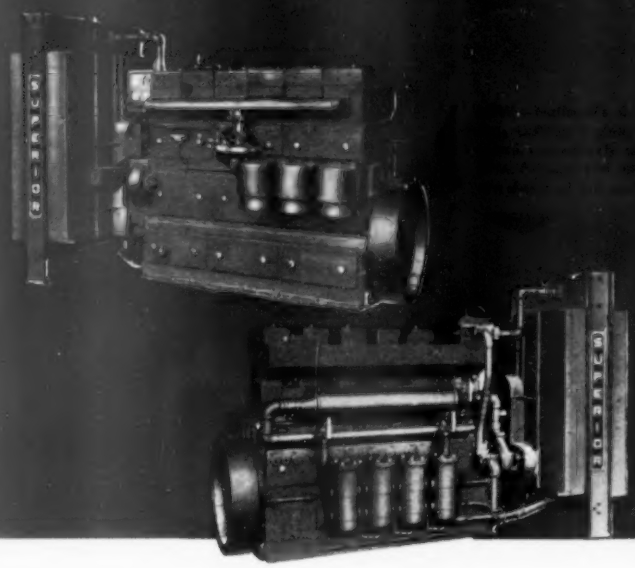
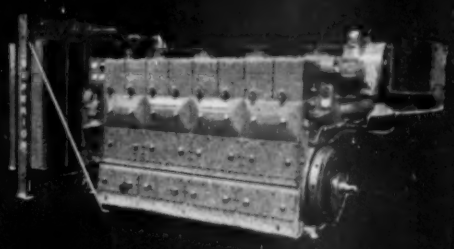
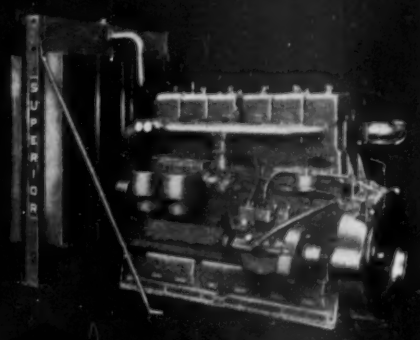
gas and diesel
Engines

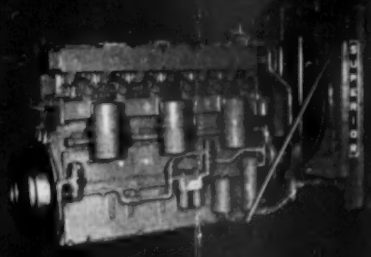


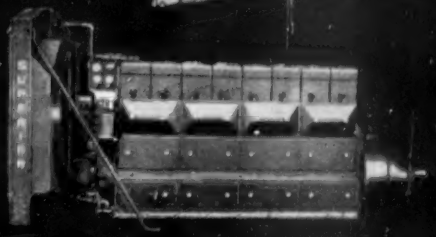
NATIONAL OIL FIELD MACHINERY AND EQUIPMENT











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Engineered for maximum simplicity in operation, complete accessibility to parts, and minimum maintenance, Superior Engines provide ample power for operation of rotaries, mud pumps and draw works in today's deepest drilling jobs.

And, to meet the wide variety of power requirements in the field, Superior manufactures an extensive line of Diesel, Dual-Fuel and Gas Engines. Superior's PTD series is built in 6 and 8 cylinder models, naturally aspirated or supercharged, for dual-fuel operation in ratings of 325, 435, 500 and 675 BHP. Superior's Gas Engine models, for natural gas or butane, are available in the 6 cylinder 6G-510 rated at 370 BHP, or in the 6 and 8 cylinder G-825 models rated at 510 and 675 BHP.

Superior Engines are so designed as to operate singly or in multiple groupings with National "Ideal" Sectional Drive Groups to meet every oil field requirement for power application in drilling.

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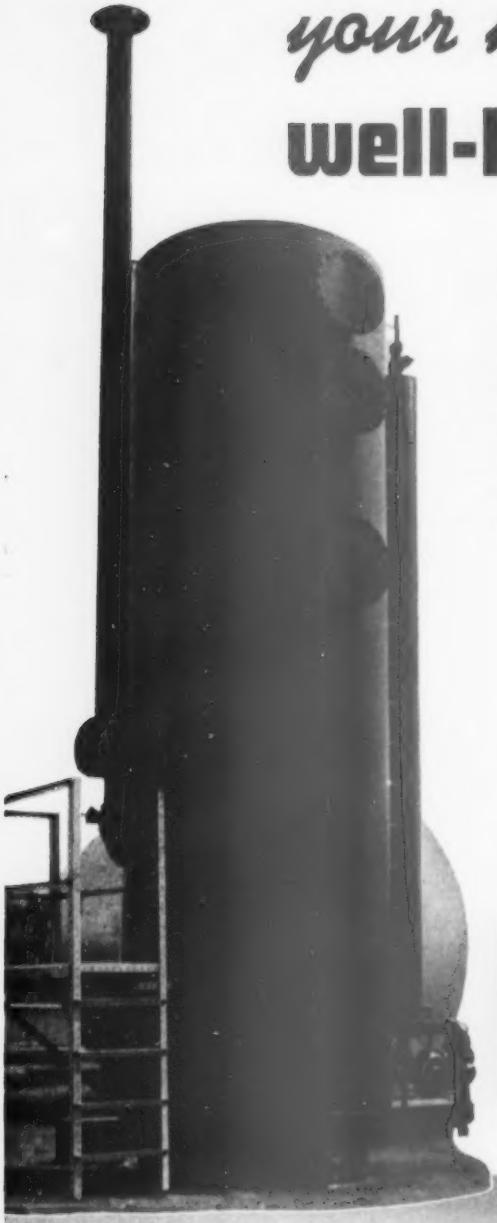
ANNOUNCING THE GRAVER SUPPLY COMPANY

your new source for
well-head equipment



We are happy to announce the formation of the Graver Supply Company to market well-head storage and separation equipment.

With Graver you have the distinct advantage of dealing with both fabricator and vendor at one time. We sell lease tanks, walkways, oil and gas separators, heaters, etc. For years this equipment has been precision fabricated by Graver. Now you can have *both* Graver quality and Graver service...readily available at all of the cities listed below. Simply contact your nearest Graver Supply representative.

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GRAVER
WELL-HEAD EQUIPMENT

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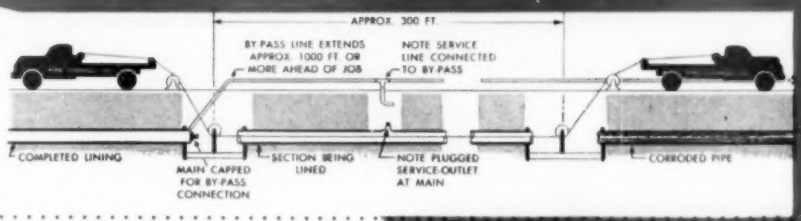
Conrad Hilton Hotel—Chicago
Nov. 9 through 12

here is an earth pipe...

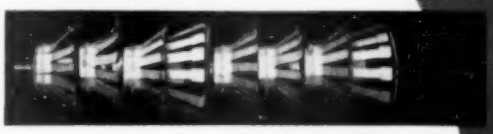
In remote parts of Asia and Africa where suitable wood and stone are scarce, aborigines made primitive pipes by forming the bowl of clay or damp earth and thrusting into it a long hollow reed for the stem. Chances were good the native absorbed as much dirt and dust as he did smoke. Compared to today's clean, "easy-draw" pipes, smoking was no pleasure!

here is a modern pipe lining operation...

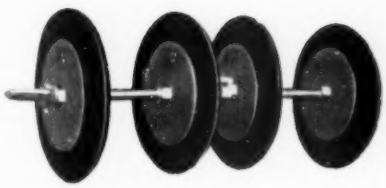
applicable to water, oil and gas pipe lines . . . using the Tate Process to renew old iron and steel pipe lines "in place"... up to 16" in diameter . . . with only momentary interruption to service while installing bypass sections.


APPROX. 300 FT.
BY-PASS LINE EXTENDS APPROX. 1000 FT. OR MORE AHEAD OF JOB
NOTE SERVICE LINE CONNECTED TO BY-PASS
COMPLETED LINING
MAIN CAPPED FOR BY-PASS CONNECTION
SECTION BEING LINED
NOTE PLUGGED SERVICE-OUTLET AT MAIN
CORRODED PIPE

here is the Steel Scraper which is pulled through the pipe. It dislodges tubercles and incrustation and makes the inside of the pipe clean and smooth.



here is the Rubber Swabber which follows the steel scraper. It drags out all loosened material and makes sure that the inside of the pipe is free and clear.



here is the Tate Process liner. It completes the renewing process by squeezing cement mortar onto the inside of the pipe wall making a smooth, continuous, water-proof lining. Liquids move swiftly without drag. Favorable flow coefficients are restored.

When removed by the Tate Process, your old pipe...

looks and performs like new pipe!

CEMENT MORTAR LINING GIVES YOU ALL THESE ADVANTAGES....

- New pipe performance
- Prevents leakage
- Restores full flow coefficients
- Reduces pumping and maintenance costs
- Protects against corrosion, contamination and discoloration . . . at much less than the cost of installing new pipe!

Pipe Linings, Inc. offers "in place" Tate Process lining service for pipe 4" to 16" and "in place" Centriline Process lining service for pipe 16" to 144". Expert, trained crews. Complete mobile equipment and facilities.

A Pipe Linings hydraulic engineer will be glad to help you. No obligation!

Write today for details on handy coupon.

PIPE LININGS, Inc.
(A subsidiary of American Pipe and Construction Co.)
4675 Firestone Blvd., South Gate, California

- ☐ Please send complete information on how to obtain new pipe line performance from my old pipe.
- ☐ Please have one of your hydraulic engineers call on me.

Name _____

Title _____

Company _____

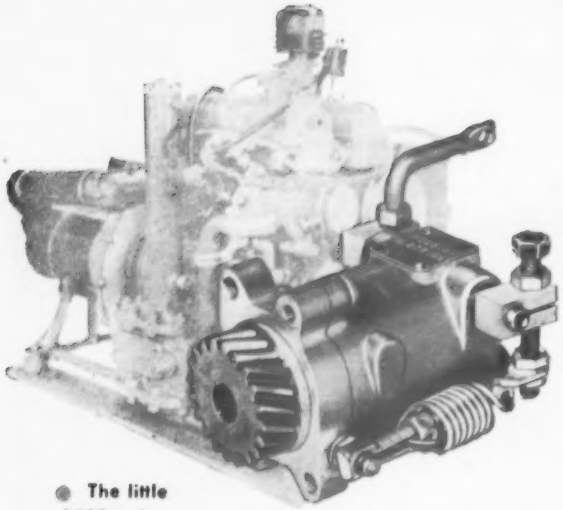
Address _____

City _____ State _____

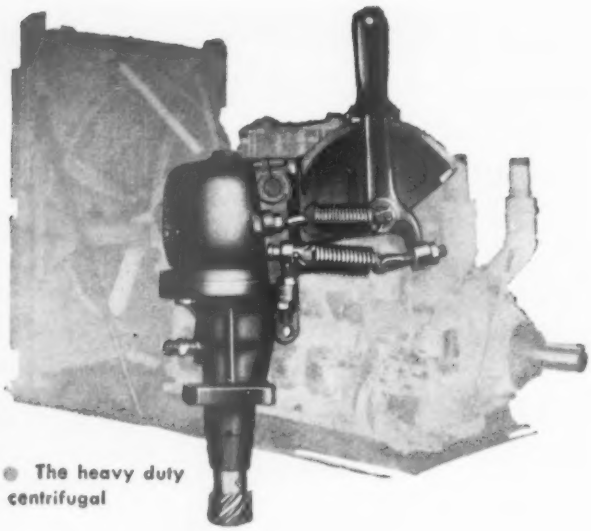
PIPE LININGS, Inc.

4675 Firestone Blvd., South Gate, California

(A subsidiary of American Pipe and Construction Co.)



● The little 1400 series

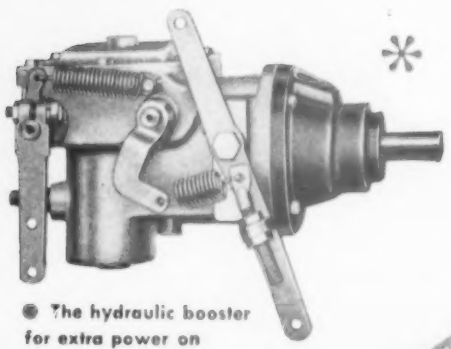


● The heavy duty centrifugal

PIERCE GOVERNORS

preferred for gas (LPG), gasoline and diesel industrial engines... big, medium and small

● The standard long range 900 series



● The hydraulic booster for extra power on racks and valves

Pierce centrifugal governors are your most economical and efficient control mechanisms for industrial engines . . . from small generator sets to monster power units . . . gas (LPG), gasoline or diesel. For engines requiring extra power to position fuel rack or valve, the Pierce centrifugal with hydraulic booster * (for original equipment only) is ideal! Service is locally available . . . your nearby Pierce Service Station is equipped for all types of Pierce Governors.

Specify PIERCE Centrifugal governors on your engines . . . for economical, thoroughly dependable control in industrial applications.

PIERCE — THE MARK OF QUALITY

THE PIERCE GOVERNOR CO., INC.
1620 OHIO AVENUE, ANDERSON, INDIANA
"World's Most Experienced Governor Manufacturer"

Higher Gasoline Yields and Increased Cracking Capacity with YORKMESH DEMISTERS in Vacuum Towers....

YORKMESH Demisters are answering Petroleum Engineers' demands the world over for simple means of improving the performance and increasing the throughput capacities of catalytic cracking units.

Yorkmesh Demisters in Vacuum Towers remove substantially all liquid entrainment even at increased vapor velocities—the gas oil then produced has lower carbon content—the reduced metals content accounts for continued high catalyst activity. The net result is more gasoline of higher octane rating.

Yorkmesh Demisters are used equally successfully to improve the performance of gas absorbers, scrubbers, separators, evaporators, knock-out drums, etc.

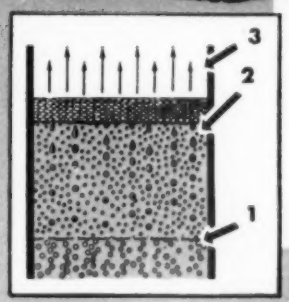
Easily installed in existing or new equipment.—Materials: Types 430, 304, 316 stainless, monel, carbon steel, etc.—Prompt shipment.

How YORKMESH Demisters work inside Vacuum Towers

1 *Vapor disengaging from liquid creates fine liquid droplets which are carried as entrainment by the vapor stream.*

2 *The liquid droplets impinge on the fine wire surfaces of YORKMESH, and are coalesced into large drops which run down and fall off the YORKMESH.*

3 *The vapor is now dry. It has been entirely freed from entrained liquid. Thus a clean gas-oil goes to the catalytic cracker.*



Write for new Catalog 13 for complete information and engineering data on YORKMESH Demisters.

OTTO H. YORK CO., INC.

77 Glenwood Place, East Orange, N. J.

THIS NEW AUTHORITATIVE GUIDE TO PIPING MOTION CONTROL SHOULD BE AN IMPORTANT PART OF YOUR BASIC ENGINEERING FILE

The New FLEXON Expansion Joint Design Guide

THE FLEXON EXPANSION JOINT LINE-UP

Flexonics Corporation manufactures a complete line of corrugated type stainless steel and copper expansion joints in Free-Flexing (low pressure), Controlled-Flexing (high pressure) and Flexoniflex (extremely high pressure) units. Sizes range from ½" to 48". Units are available for temperatures from —400° F., to 1600° F., and for pressures from vacuum to 5500 psi. Write for further information or see the Flexonics catalogs in Sweet's Plant Engineering File, Chemical Engineering Catalog or The Refinery Catalog.

Now at last, comprehensive, up-to-date information on the absorption of motion in piping has been gathered together in one easy-to-use booklet. In its new Expansion Joint Design Guide, Flexonics Corporation offers an authoritative handbook of piping design and layout! Included in the booklet are thorough discussions of types of motion, design considerations pertaining to the physical characteristics of expansion joints and anchoring and guiding, typical piping layouts, computation of thermal expansion, safety factors and many other vitally important factors in piping design.

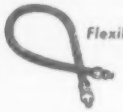
Much of the information presented is available nowhere else; all of it helpful to anyone responsible for the design, installation or maintenance of piping. Copies of the Flexon Expansion Joint Design Guide are available without charge. Write for your copy, today.

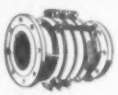
Flexonics *Corporation*

EXPANSION JOINT DIVISION
1345 S. THIRD AVENUE · MAYWOOD, ILLINOIS

FORMERLY CHICAGO METAL HOSE CORPORATION
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Flexon identifies products of Flexonics Corporation that have served industry for over 50 years.


Flexible metal hose


Expansion joints

Aircraft components

Metallic bellows

Tubing Problems?

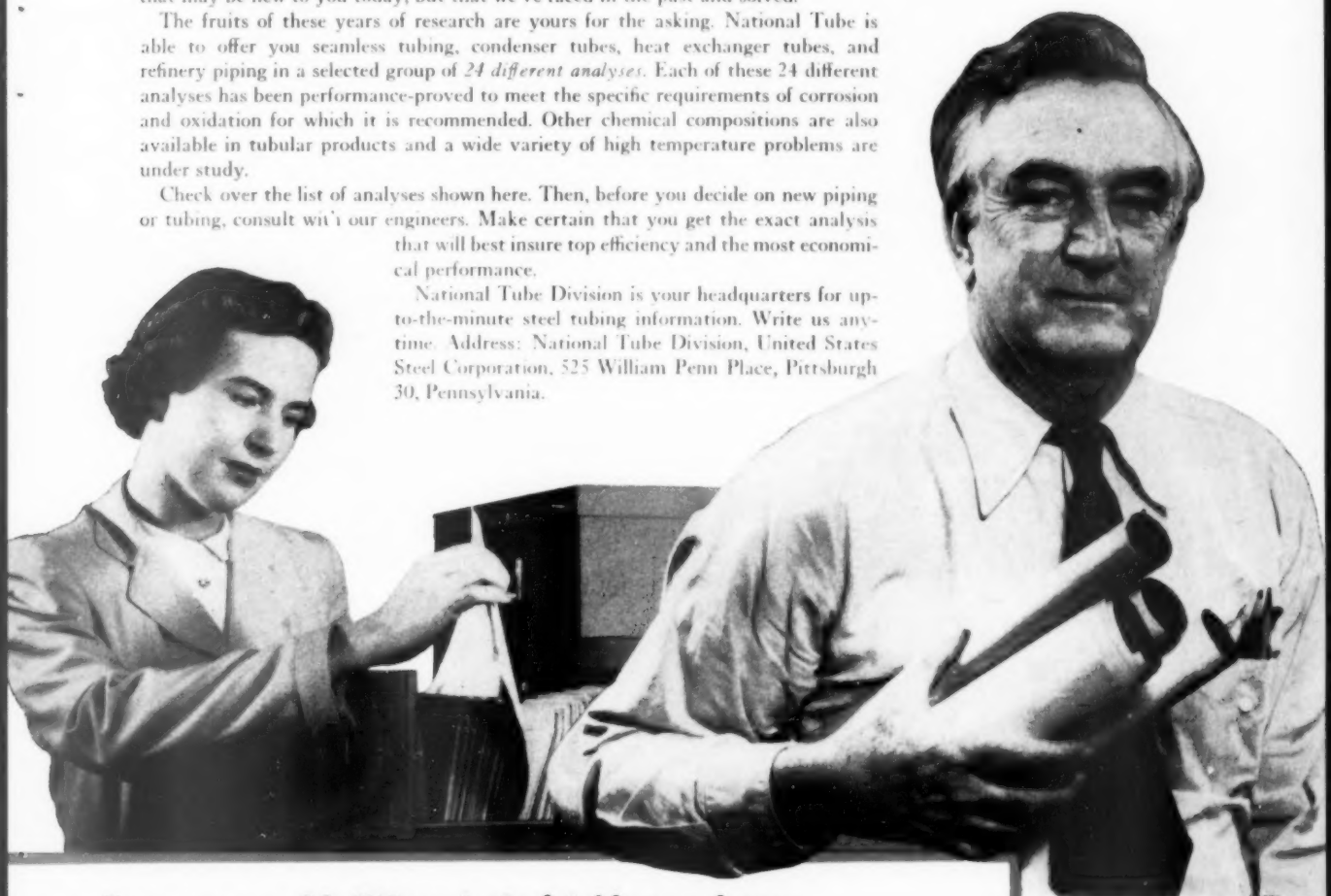
Put our "experience file" to work on them

● Our "experience file" is made up of case histories dealing with practically every condition or combination of conditions that might cause premature pipe or tubing failure. These case histories are the result of 60 years of working on tubing problems that may be new to you today, but that we've faced in the past and solved.

The fruits of these years of research are yours for the asking. National Tube is able to offer you seamless tubing, condenser tubes, heat exchanger tubes, and refinery piping in a selected group of *24 different analyses*. Each of these 24 different analyses has been performance-proved to meet the specific requirements of corrosion and oxidation for which it is recommended. Other chemical compositions are also available in tubular products and a wide variety of high temperature problems are under study.

Check over the list of analyses shown here. Then, before you decide on new piping or tubing, consult with our engineers. Make certain that you get the exact analysis that will best insure top efficiency and the most economical performance.

National Tube Division is your headquarters for up-to-the-minute steel tubing information. Write us anytime. Address: National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



Here are our 24 different steel tubing analyses:

Carbon	2¼ Cr, 1 Mo	7 Cr, ½ Mo	27 Cr
Carbon, ½ Mo	2½ Cr, ½ Mo, ¾ Si	8 Cr, ½ Mo	18-8
½ Cr, ½ Mo	3 Cr, 1 Mo	8 Cr, 1 Mo	18-8 Ti
1 Cr, ½ Mo	5 Cr, ½ Mo	9 Cr, 1 Mo	18-8 Cb
1¼ Cr, ½ Mo	5 Cr, ½ Mo, 1½ Si	12 Cr, Al	18-8 Mo
2 Cr, ½ Mo	5 Cr, ½ Mo, Ti	17 Cr	25-20

All National Seamless Tubes are pierced from a solid billet of high-quality steel. This is the one manufacturing method that removes all doubt concerning uniform wall strength.

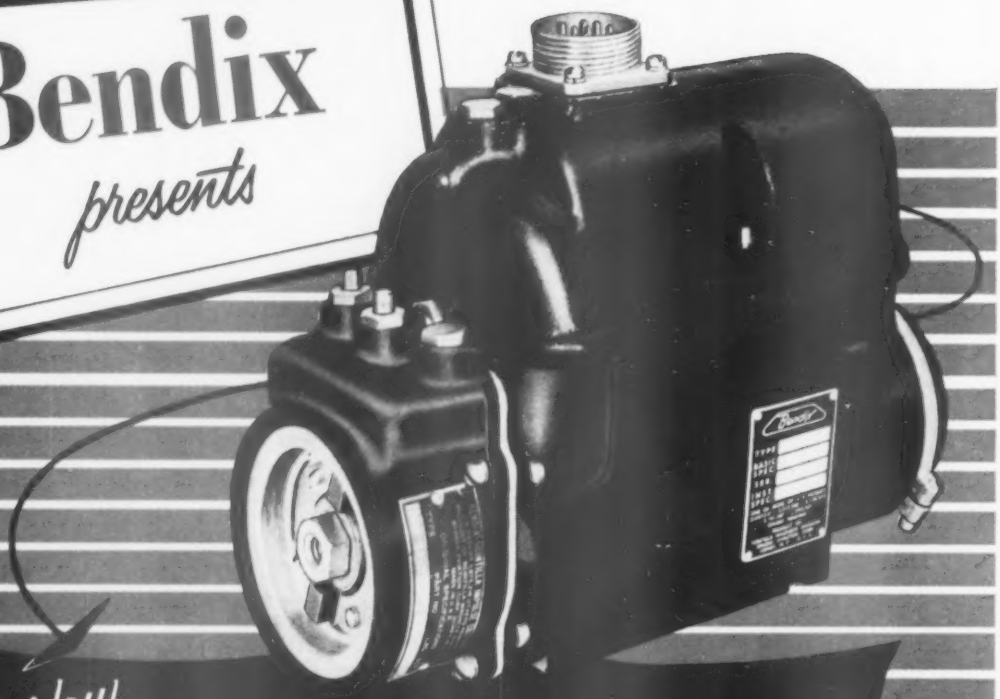
NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

U·S·S NATIONAL SEAMLESS PIPE AND TUBES

UNITED STATES STEEL

Bendix *presents*



a New Low Tension, Hi-Output

LAR Magneto

...with

HIGH OUTPUT COIL, this Bendix coil is specially designed to give high compression engines maximum performance.

SINGLE ELECTRICAL OUTLET Only one electrical connector, the famous Bendix-Scinflex type required for all low tension outlets.

This new type LAR Bendix Magneto incorporates all the outstanding characteristics of its famous predecessor the LA Magneto plus important additional features.

The LAR series Magnetos utilize a single Bendix-Scinflex electrical connector for all low tension outlets, including the ground terminal. This permits quick, easy installation since all electrical connections are in the one plug-in connector.

In the interest of standardization, dimensions are held as closely to the standard LA Magneto as possible and mounting dimensions are identical.

Designed for high compression ignition requirements, the LAR Magneto has all the engineering quality that has made the name Bendix "The Most Trusted Name in Ignition."

Descriptive folder available on request.

Bendix SCINTILLA MAGNETO DIVISION of Bendix AVIATION CORPORATION
SIDNEY, NEW YORK

Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y

FACTORY BRANCH OFFICES: 118 E. Providencia Avenue, Burbank, California • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan
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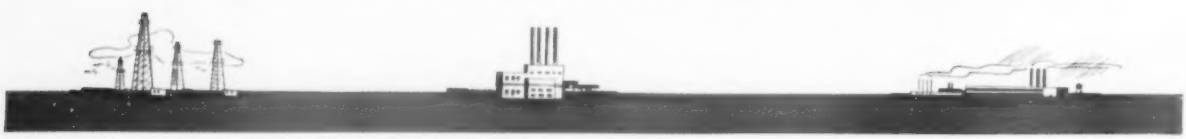


Because the oil industry rarely receives full credit for its share in the development of automotive transportation, Ethyl is publishing this special advertisement in the Fiftieth Anniversary issue of "Motor" magazine.

Why is automotive progress like a man washing his hands?

Did you ever try to wash *one* hand? You know it's all but impossible. As the old saying goes, "one hand washes the other."

Improving transportation is also a two-handed affair. One "hand" is the automotive industry. The other is the petroleum industry. Again and again, progress in one has been made practical by a complementary development in the other.

For example, it was the proved ability of the oil industry to provide high octane fuels, through improved refining methods and the use of "Ethyl" antiknock compounds, that prepared the way for higher compression engines. And to prove

(*Continued on next page*)

Printed in U.S.A.

Why is automotive progress like a man washing his hands?

(*Continued from preceding page*)

that it works both ways, the engineering genius of the automobile industry took full advantage of better gasolines to produce more and more efficient engines.

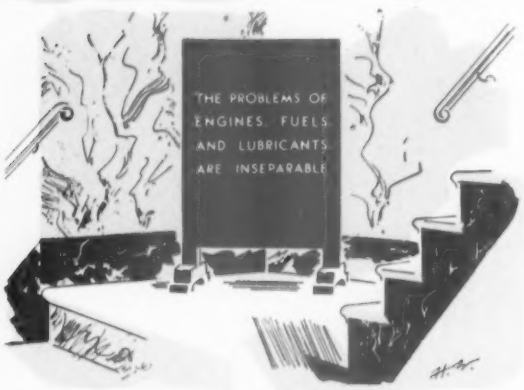
Ethyl people, recognizing this interdependence between engines and fuels, have made it the keynote of Ethyl's research and cooperative projects for the past 30 years.

We hesitate to predict what future progress will bring, but one thing is certain —that this progress will be the result of two of America's greatest industries working hand in hand. And Ethyl research people will continue to work with both industries and to serve in a very special way as liaison between them on problems of fuels and engines.

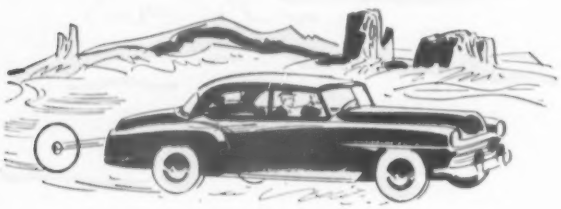
ETHYL CORPORATION

NEW YORK 17, NEW YORK

WORTH NOTING



These words are inscribed at the main entrance of the Ethyl Research Laboratories in Detroit.

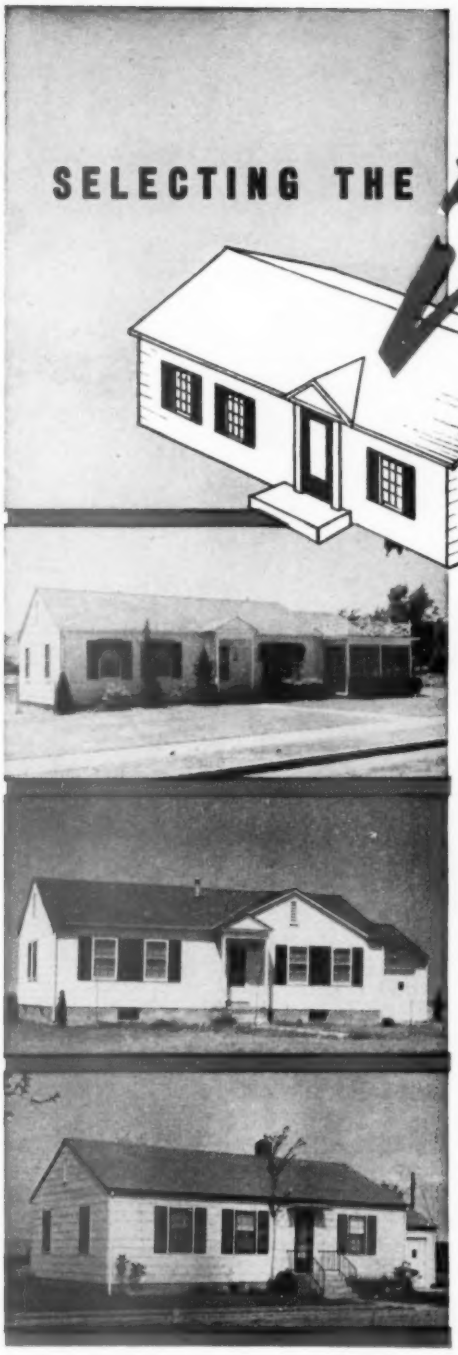


Every year Ethyl buys a representative group of new cars in order to give the petroleum industry full information as to the octane requirements of these cars.

While still a young man, Thomas E. Midgley, one of America's greatest chemists, discovered the use of tetraethyllead as an antiknock agent and so became one of the chief architects of today's automotive progress!

Ethyl Service is backed by 30 years of antiknock experience

SELECTING THE *RIGHT* FIELD HOUSING IS *IMPORTANT...*



It's good employee relations to see that oil field workers have comfortable homes. It is good business to select field housing that has proved right for the oil industry for almost 35 years.

STURDYBILT Prefabricated Houses are *right* for the oil fields because they are economical, easy to erect, can be moved from one site to another, and are handsome and comfortable enough to suit the most particular oil field family.

Get the RIGHT field housing. Order STURDYBILT Prefabricated Houses.

■ WRITE FOR INFORMATION

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS: CURTIS WOODWORK

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

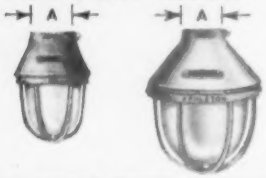
PREFABRICATED HOME MANUFACTURERS INSTITUTE phmi

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Relamp or Convert to Higher Wattages in **SECONDS...**

with APPLETON vented Explosion-Proof Fixtures

APPLETON INTERCHANGEABLE UNILET BODY FEATURE



Note how identical diameters "A" at top of Dome Unit Assembly permit mounting of all fixtures regardless of wattage.

58 SECOND RELAMPING

When the call comes for relamping, AA-51 Series STAND-BY Units are ready at an instant's notice. Carrying handles can be attached in advance.

Maintenance man needs only a screw driver to exchange units. From the time of climbing the ladder to exchanging fixture and descending ladder, only 58 seconds are required.

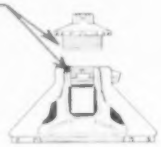
Burned out lamps and cleaning fixture are safely attended to at the work bench, while production schedules are maintained.

Standardized Unilet Body Permits 58 Second Interchange of 60 Watt to 500 Watt Fixtures . . . Saves Time, Prevents Shutdowns! *Appleton* AA-51 Series Vented Explosion-Proof Fixtures offer the most complete protection available today against spark-caused disaster . . . plus the shortest possible lamp exchange time regardless of individual lamp wattage, with no loss of man-hours and no lengthy machinery shutdowns.

The AA-51 Series meets all Underwriters' Laboratories requirements for Class I, Groups *C* and *D* Hazardous Locations.

More and more plants in the petroleum industry are standardizing on *Appleton* for maximum, efficient protection in hazardous areas. Full details are available. Write Today for Bulletin!

- **"FLAME-TIGHT" CONTACT CHAMBER** — Because of *Appleton's* exclusive "5-Thread Safety Chamber" any AA-51 Series Unit can be serviced with complete safety even if current is inadvertently left on!
- **"FULL-CIRCLE" VENTING** — The notched globe ring and the porous metal interior dissipate heat evenly and safely and keep fixture temperature cool enough to prevent igniting explosive gases.
- **"STAND-BY" SYSTEM SAVES MONEY** — For every ten AA-51 Units in operation *Appleton* recommends one unit as a stand-by . . . ready for relamping or wattage conversion in 58 seconds.



SOLD THROUGH ELECTRICAL WHOLESALERS

APPLETON ELECTRIC COMPANY
1718 Wellington Avenue • Chicago 13, Illinois

APPLETON ELECTRIC PRODUCTS — REG. U.S. PAT. OFF.

Also Manufacturers of:

Malleable Iron Unilet Fittings

Industrial Lights

"ST" Series Connectors

Outlet Boxes

Oil Painting by Tom Hill especially for Barrett Division

Hot stuff...for rough duty!

To assure pipe preservation, protective coal-tar enamels must be applied while hot. Two factors are all important if pipelines are to survive tough climates and rough conditions. One is the **right** protective coating. The other—proper application. When you specify Barrett—you can get **both!**

Barrett not only offers the finest protective coatings, but also the services of a Barrett Technical Advisor. He will help you to determine the **exact** coating to meet specific needs and requirements and still keep cost to a minimum.

In the field, where pipe preparation and coating application are of vital importance, a Barrett Service Representative is available to advise and render aid learned from years of pipeline experience. Barrett inspectors are available whenever needed. It is for this purpose that Barrett maintains field offices strategically located throughout the country.

Write, phone or wire for further information and a free copy of Barrett's Field Manual. It's a valuable book concerned with detailed application procedures. Send for it today.

BARRETT DIVISION
Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N. Y.

In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal

For punishing pressures

THREDKOTE

REG. U. S. PAT. OFF.

703

This unique thread compound was developed for use on tubing strings in condensate wells where pressures are over 2,000 pounds a square inch. Its high zinc content (85% metallic zinc) materially reduces leakage problems. Thredkote 703 is also effective on tool-joint and drill collar threads.

No single thread compound can do the best job on all connections. Fill your need from a complete line of Thredkote compounds for practically every type of threaded connection.

Thredkote 701—for "bucking" tool-joints onto drill pipe; contains 60% pure metallic zinc.

Thredkote 702—for use on mud, water and steam lines; contains a filler of graphite.

Thredkote 705—for use when the tool-joint becomes loose from thread and shoulder wear; contains plastic fillers.

Thredkote 708—for use on oil and gas lines; has dispersed synthetic fillers that produce a seal insoluble in either petroleum or water.

THREDKOTE

REG. U. S. PAT. OFF.

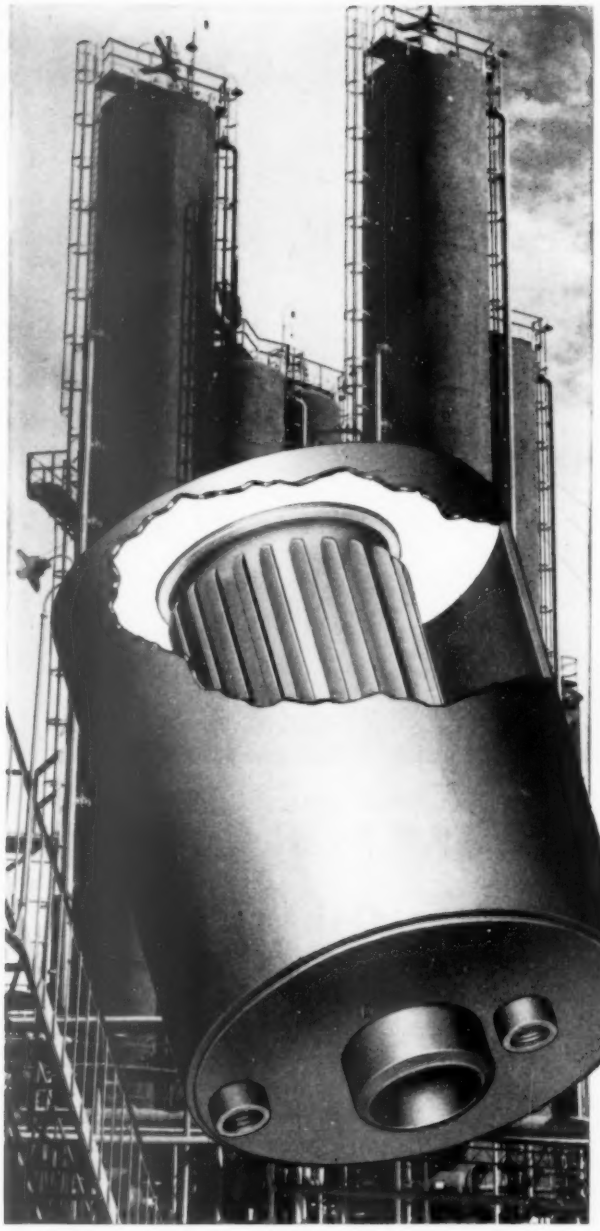
Marketed by

The Carter Oil Company

Denver, Colorado

and by the manufacturer

Humble Oil & Refining Co. Houston, Texas



Recover Valuable Solids In Processing Vessels With... Hi-eF PURIFIERS!

OVER 99% EFFICIENCY

ENABLES ENGINEERS TO OVERCOME

MANY ENTRAINMENT PROBLEMS

Many petroleum engineers find Hi-eF Purifiers one of the easiest ways to increase process efficiency. Installed inside or on the line near process vessels such as fractionating columns, bubble cap towers, packed towers, stills and similar equipment, purifiers prevent carryover from leaving the vessel. This steps up process efficiency in 5 ways:

1. Permits towers to be operated at greater capacities.
2. Prevents valuable solids from leaving the process vessel.
3. Stops contamination of subsequent process with guck, solids, etc.
4. Avoids contamination of distillate and other products and processes with foreign entrainment.
5. Increases operating efficiency of process equipment.

Refiners using the Hi-eF method recognize the superiority of these stationary, maintenance free, filterless separators. For a solution to your problem, mail coupon for further details.

Watchdogs of STEAM • AIR • GAS • VAPOR • Pipelines and Equipment

UPFLOW INTERNAL PURIFIER

LARGE LINE TYPE PURIFIER

DOWNFLOW INTERNAL PURIFIER

RECEIVER TYPE PURIFIER

THE V. D. ANDERSON COMPANY

1992 West 96th Street • Cleveland 2, Ohio

Please send me a copy of Bulletins describing your purifiers for the petroleum industry.

Name ..... **Title** .....

Address .....

City .....

State .....

BY THE MAKERS OF SUPER-SILVERTOP STEAM TRAPS

Roads or No Roads...

The 'Jeep' Goes Through When Others Can't!

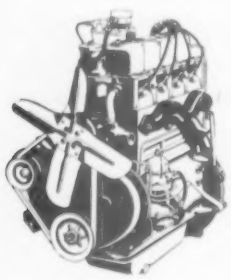
Where there's a Universal 'Jeep' there is always a way to get through—even to the most remote locations.

'Jeep' 4-wheel-drive traction is the difference between pulling through and being pulled out . . . between gaining ground and losing time. That is why the 'Jeep' outperforms ordinary vehicles in oil fields everywhere.

With its all-wheel traction and *Hurricane* Engine power, the 'Jeep' travels the roughest and muddiest oil country . . . it climbs grades up to 60 percent. And the 'Jeep' is built to stand up under grueling day in and day out service.

Ask your Willys dealer to demonstrate the "go-anywhere" ability of the Universal 'Jeep'. Get all of the facts.

4-WHEEL-DRIVE UNIVERSAL 'Jeep'®



HURRICANE F-HEAD ENGINE

Power increased 20 percent—a big decrease in fuel consumption—that's the result of Willys sensational *Hurricane* Engine. It's of F-head design with valve-in-head intake and valve-in-block exhaust. Compression is 6.9 to 1, but it does not require premium fuel.

WILLYS MOTORS, INC., TOLEDO 1, OHIO • WORLD'S LARGEST MAKERS OF 4-WHEEL-DRIVE VEHICLES

THE NEW CF&I SEAMLESS TUBE MILL...

designed to meet oil country demands

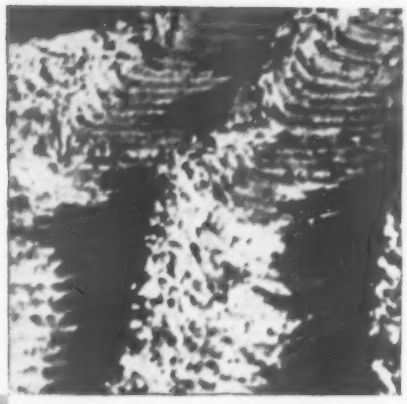
This new Seamless Tube Mill is the latest addition to the extensive CF&I production facilities at Pueblo, Colorado. Utilizing the most modern equipment in an up-to-date, efficient plant layout, the mill produces seamless steel tubular products. CF&I seamless oil country tubular goods meet all API specifications and are available in sizes ranging from 2⅜" O.D. through 9⅝" O.D.

CF&I TUBULAR PRODUCTS

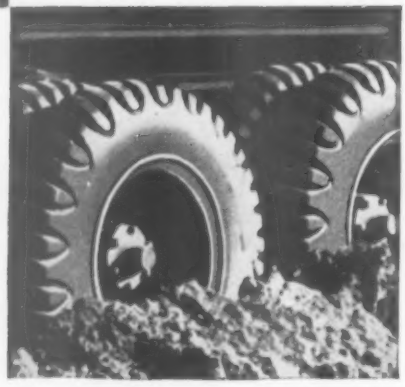
THE COLORADO FUEL AND IRON CORPORATION
DENVER, COLORADO

1976

THE TRACK OF A



Mack TELLS A STORY OF Power



Ever notice the ground where a Mack six-wheeled truck has passed over? No scuff marks here. The track of a Mack tells a story of unfaltering traction . . . of surefooted, relentless driving power.

The "reason why" is found in Mack's Balanced Bogie with exclusive inter-axle and inter-wheel Power Dividers that assure positive traction under the most adverse conditions. Acting normally as a true differential, the Power Divider delivers torque between the bogie axles and wheels in proportion to wheel traction, thus eliminating useless wheel slippage and spinning.

Your nearest Mack branch or distributor will show you how Mack six-wheelers can keep your big loads moving fast—no matter how tough the terrain—on dependable, time-saving, cost-cutting schedules.

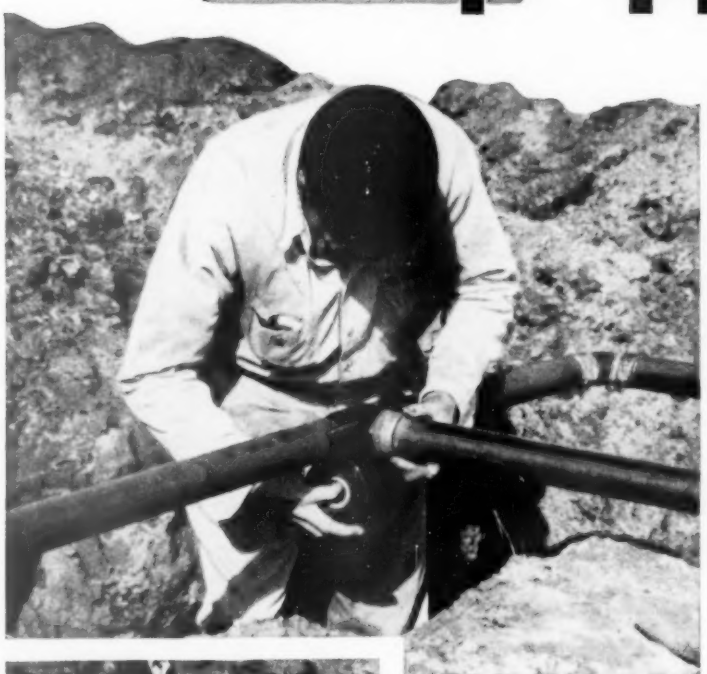
Mack TRUCKS

1726

. . . Outearn Them All

Mack Trucks, Empire State Building, New York 1, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

Fight corrosion with easy 1-step application



Polyken Protective Tape Coatings are ideal for use on couplings, joints and holidays. Conforms readily, goes on quickly . . . to speed the job and cut costs.

New Polyken Protective Tape Coatings may be applied by portable machine up to 30 feet per minute even by inexperienced workmen.

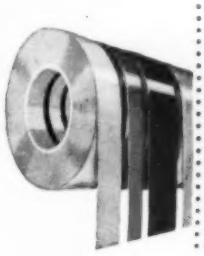
You can apply this *Polyken* pressure-sensitive tape economically by hand or machine just as it comes off the roll. Pipes are coated uniformly and evenly in one simple step. You don't have to mess with heating or mixing. There are no liquids, solvents or thinners to use . . . no cumbersome or expensive machines to operate or clean . . . and no delay for drying time.

Yet, simple as application is, *Polyken* Protective Tape Coatings can be depended upon to guard pipes against corrosion for a long, long time. And that goes for pipes in any location—above or below ground, in the plant or in the field.

Polyken Tape No. 900, black (also available in gray, No. 910) is the polyethylene plastic tape coating made by an exclusive *Polyken* process. See for yourself how your corrosion problems can be solved this easy way. Mail the coupon for free samples and details.

Polyken®
PROTECTIVE COATINGS
POLYKEN PRODUCTS DEPARTMENT OF THE KENDALL COMPANY

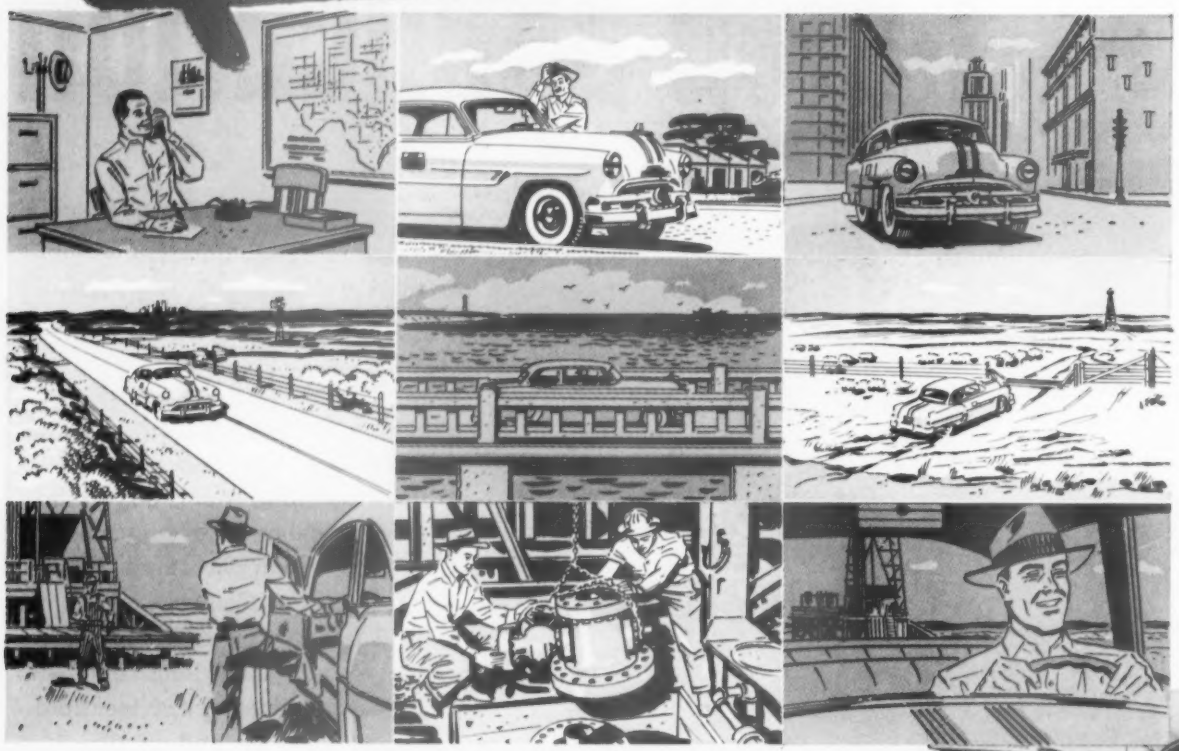
TAILORED TO YOUR JOB



Polyken, Dept. OGK
222 West Adams St., Chicago 6, Illinois
Please send me samples and further information on *POLYKEN* PROTECTIVE TAPE COATINGS.

Name_____ Title_____
Company_____
Street Address_____
City_____ Zone____ State_____

CAN YOU FIND THE MORAL TO THIS STORY?



At O-C-T, we believe good field service to our customers is just as important as building good wellhead equipment. As a result, we are as conscious of the working conditions of our field servicemen as we are the working condition of O-C-T equipment. When your O-C-T representative answers your service call, he is equipped to travel quickly and comfortably to your well. We believe this enables him to do a better job for you. We suggest that you consider service as well as equipment on your next well. O-C-T is the leader on both counts.

We have used Pontiacs for our field cars at O-C-T for a number of years. They have proved highly dependable. We have been very well satisfied with their economy and performance over the years. That's why O-C-T has selected Pontiac for its official car.

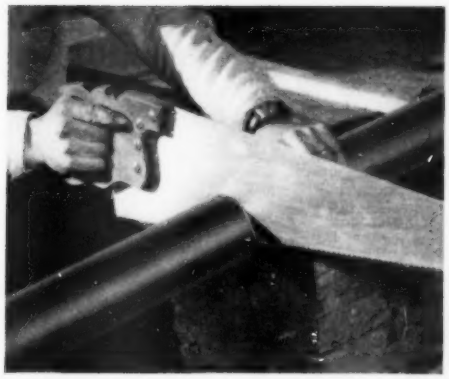
John Mecker
President, O-C-T.

Oil Center Tool Co.

P. O. Box 3091 Houston, Texas

Moral: When you buy O-C-T Products, you are assured dependable performance and prompt, efficient service.

1 *cut*



2 *cement*

3 *assemble*

Join Tenite plastic pipe in 3 simple steps

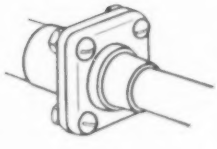
Whether you are making up ½" or 4" pipe, Tenite butyrate fittings save time, effort, and money. To install them you need only a saw, a paintbrush, and solvent cement. Simply cut the pipe, apply solvent with paintbrush, slip on the fitting – the joint is done . . . This fast procedure eliminates thread-cutting and the necessity for lugging clumsy, heavy tools around the job. Alignment is neater, easier to achieve. Moreover, the finished joint has the same toughness and exceptional corrosion resistance as the Tenite pipe itself.

A wide range of Tenite plastic fittings is now available from various manufacturers. Use the coupon below or write for a list of sources and further information about the advantages of using Tenite butyrate pipe and fittings.

EASTMAN CHEMICAL PRODUCTS, INC.
Kingsport, Tennessee

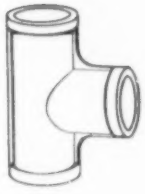
Sales representative for
TENNESSEE EASTMAN COMPANY
Division of Eastman Kodak Company

90° ELBOW



FLANGE UNION

45° ELBOW



TEE

45° LATERAL

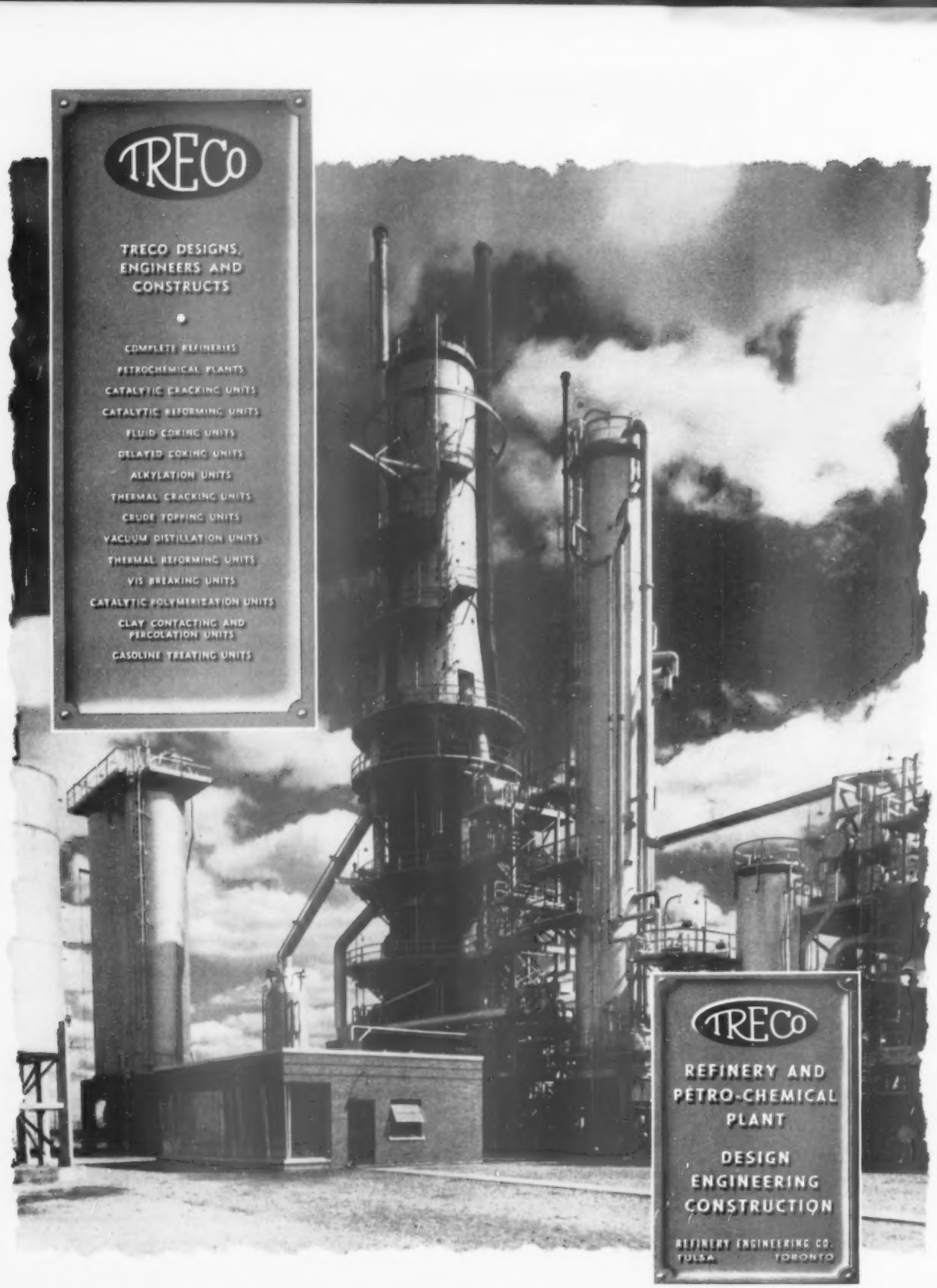
TRUE "Y"

TENITE
BUTYRATE
an Eastman plastic

EASTMAN CHEMICAL PRODUCTS, INC.
Kingsport, Tennessee

Please send me a list of sources of Tenite butyrate fittings and pipe
_____Also send me literature

NAME .....
POSITION .....
COMPANY .....
ADDRESS .....



REFINERY ENGINEERING Company

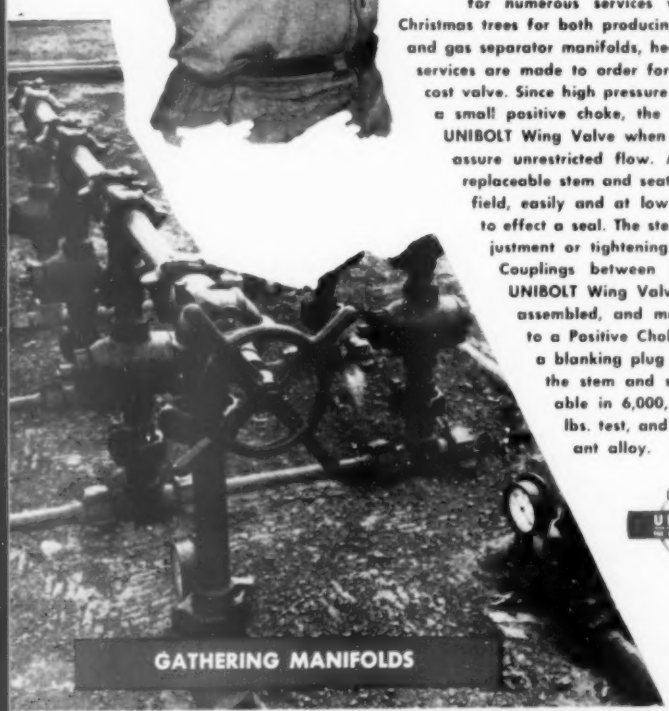
TULSA, OKLAHOMA TORONTO, ONTARIO

wherever flow control is important

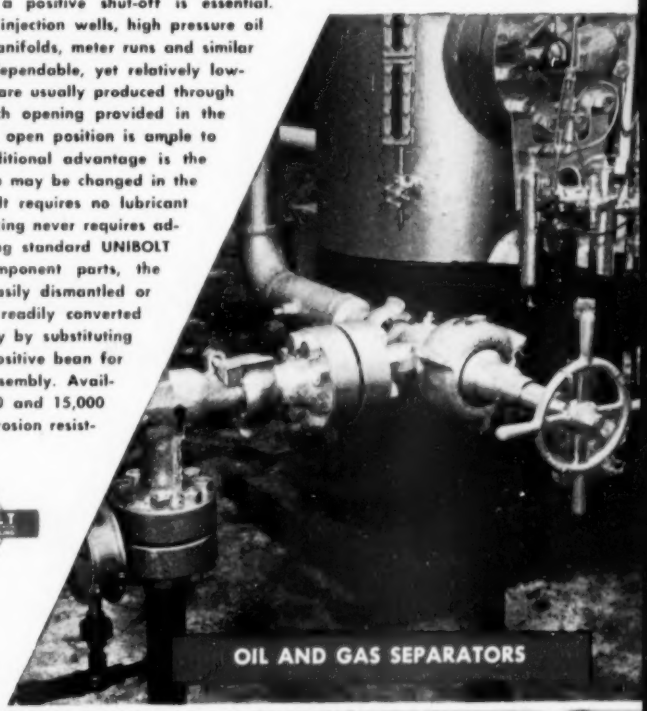
UNIBOLT

adjustable wing valves are your best bet !

The UNIBOLT Wing Valve, designed originally for use as an adjustable choke where well conditions did not demand a positive choke, has become popular with production men as a dependable valve for numerous services where a positive shut-off is essential. Christmas trees for both producing and injection wells, high pressure oil and gas separator manifolds, heater manifolds, meter runs and similar services are made to order for this dependable, yet relatively low-cost valve. Since high pressure wells are usually produced through a small positive choke, the one-inch opening provided in the UNIBOLT Wing Valve when in full open position is ample to assure unrestricted flow. An additional advantage is the replaceable stem and seat, which may be changed in the field, easily and at low cost. It requires no lubricant to effect a seal. The stem packing never requires adjustment or tightening. Having standard UNIBOLT Couplings between its component parts, the UNIBOLT Wing Valve is easily dismantled or assembled, and may be readily converted to a Positive Choke Body by substituting a blanking plug and positive bean for the stem and seat assembly. Available in 6,000, 10,000 and 15,000 lbs. test, and in corrosion resistant alloy.

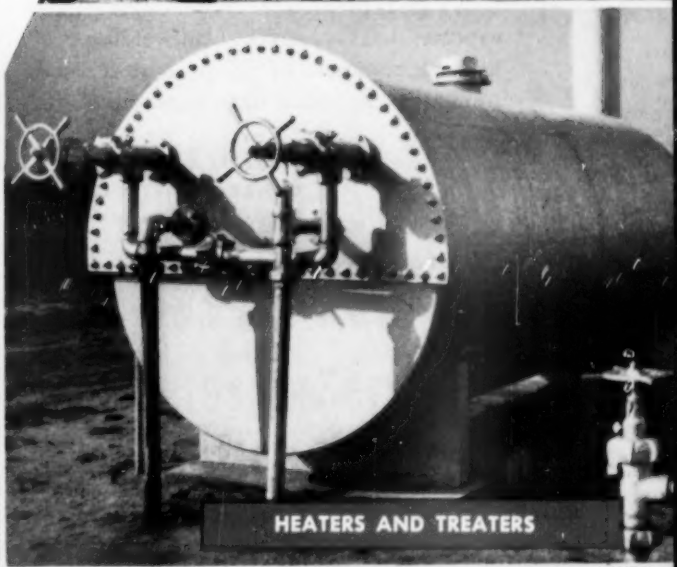


GATHERING MANIFOLDS



OIL AND GAS SEPARATORS

CHRISTMAS TREE FLOW MANIFOLDS



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10 WAYS BETTER

Uniform Wall Thickness
Strong, Sound Welds
Round and Straight
✓ Easy to Weld
Free from Scale
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Long Lengths
Easy to Contour-bend
High Yield Point
Precision Made

✓ ENDS MATCH-UP RIGHT

...on Republic Electric Weld Line Pipe

The way Republic Electric Weld Line Pipe is made . . . from flat-rolled steel . . . assures you of getting pipe that is uniformly round and that has uniform walls. Your crews will find it easy to line up and easy to weld uniformly tight and strong, because carbon content is low.

The cost of laying Republic Electric Weld Line Pipe is predictable . . . a minimum of unexpected delays caused by field-welding problems—a minimum of delays to shift out-of-round pipe to obtain tight match-up of ends for welding—no delays because of poor pipe surface or defects.

All over the country, crews have been beating schedules in laying Republic Electric Weld Line Pipe. Pipe line construction budgets are being maintained. After back-filling, there are no worries about maintenance or leaks.

Increased facilities at Republic's large pipe plants make it even more possible for you to join the companies which have laid over 67,000 miles of Republic Electric Weld Line Pipe in 24 years.

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Republic
REPUBLIC STEEL
ELECTRIC WELD LINE PIPE

Other Republic Products include Casing and Tubing—Carbon, Alloy and Stainless Steels—Studs, Bolts and Nuts—Heat Exchanger Tubes

there's NO END

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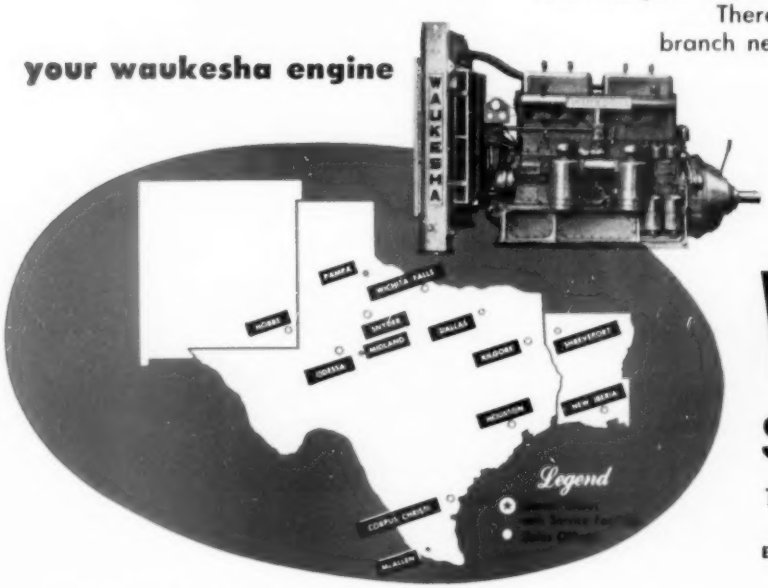
From sun-up to sun-up . . . right around the clock . . . your nearby Waukesha Sales and Service, Inc., service shop is ready to give prompt attention to your repair needs. Each branch is staffed with experienced, factory-trained mechanics who ***know*** your engine and how to keep it in tip-top condition at lowest cost. So the next time your engine needs servicing . . . bring it back home. There is a Waukesha Sales and Service, Inc., branch near your operations in Texas, Louisiana, Southern Arkansas, and New Mexico.

your waukesha engine



is treated best at home

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Sales & Service, Inc.

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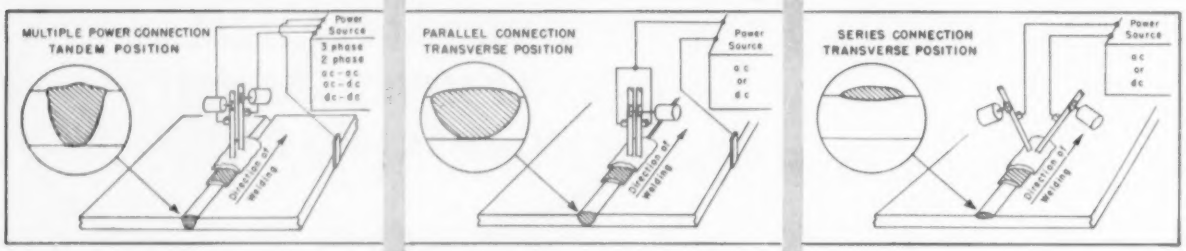
EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, LOUISIANA AND NEW MEXICO

CUT YOUR WELDING TIME IN HALF *with* UNIONMELT Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.

Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.

Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE's engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

Linde
TRADE-MARK

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
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The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Service - Yes Sir!!

1 Photo showing Peerless Line Separators at Pipeline Station in Oklahoma.

2 Peerless Horizontal Separator handling 240,000,000 cu. ft. per day, while removing condensed liquid from cooling tower, at plant in California.

3 Two Peerless Vertical Scrubbers at a power plant in South Texas, each handling 50,000,000 cu. ft. of gas per day.

PEERLESS HAS SERVICE everywhere!

Wherever you go, throughout the oil country, you'll find qualified Peerless Sales and Service Representatives ready to help you with your problems on the separation of liquids from gases.

See the Peerless Representative nearest you. Addresses below.

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BUFFALO	493 Franklin Street
PHILADELPHIA	105 Forest Ave. Narberth
PITTSBURGH	301 Farmers Bank Building
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CONTRIBUTION TO THE ECONOMICAL AND TROUBLE-FREE PRODUCTION OF OIL

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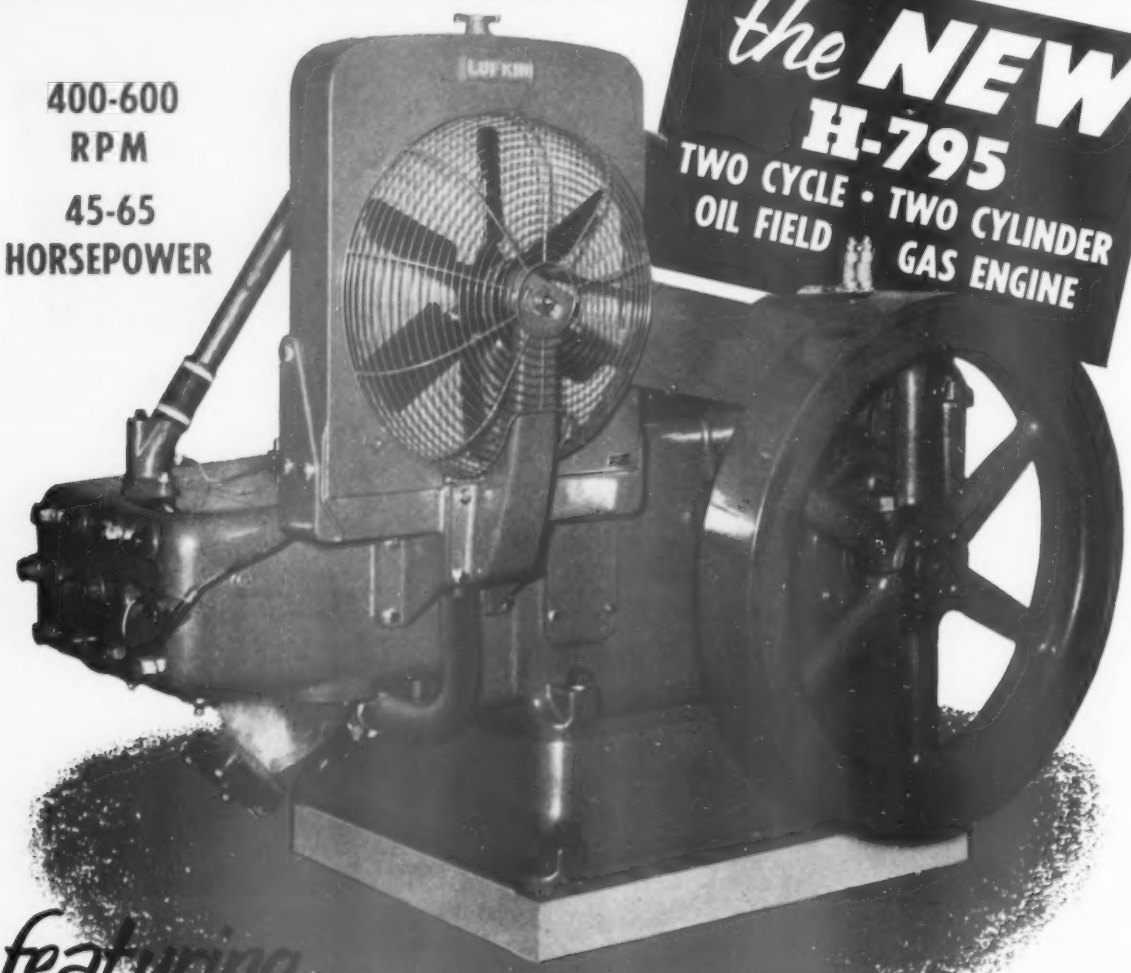
HORSEPOWER



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H-795
TWO CYCLE • TWO CYLINDER
OIL FIELD GAS ENGINE

featuring

- THERMOSYPHON COOLING
- BUILT IN ELECTRIC OR AIR-GAS STARTER
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Lufkin Equipment in CANADA is handled by
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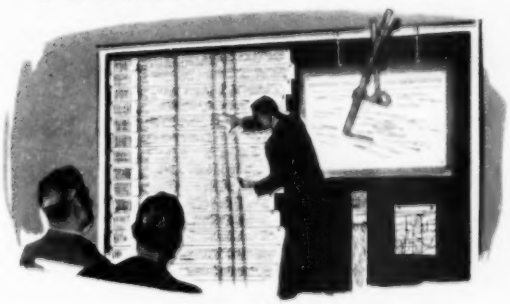
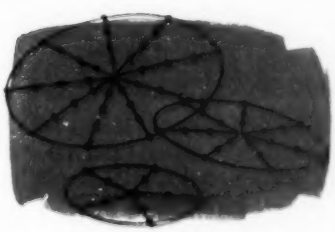
SEI

EXPERIENCE



INTERPRETATION



TECHNIQUE

For twenty-one years, SEI has specialized in sub-surface studies of the domestic oil provinces . . . from Canada to the Gulf. Numerous innovations in instrumentation, interpretation, and field technique have kept SEI in the forefront. For example, in difficult areas, SEI has been a pioneer in the use of patterns of multiple shot holes and geophone arrays.

Your exploration program is in capable hands at SEI.

SEISMIC EXPLORATIONS INCORPORATED

1007 SOUTH SHEPHERD • HOUSTON, TEXAS

Century 30 horsepower Drip Proof Motor on a pumping unit.

Century Oil Industry Motors'

RUGGED CONSTRUCTION

Keeps Them on the Job— Day After Day After Day

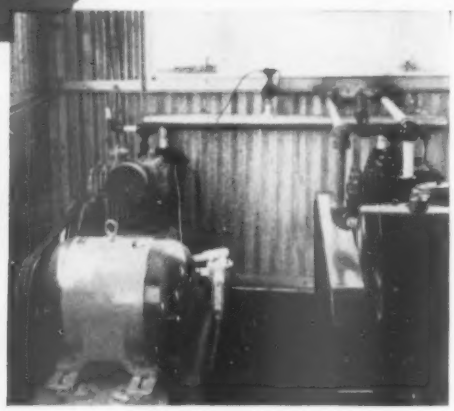
Century Motors are deliberately built to meet the unlooked for conditions. They will stand up under tough 3-shift continuous operation, when necessary. You'll find Century Motors giving satisfactory service in oil fields throughout the world.

FOR OIL PRODUCTION: Century Splash Proof Motors are widely used on outdoor installations such as pump rigs. Type SCT high torque, high slip motors start stiff pumps easily—and minimize shock reaction to pump parts.

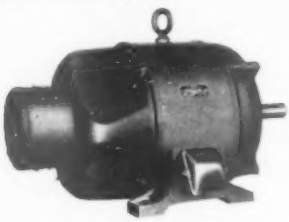
FOR REFINING AND DISTRIBUTION: Century "Underwriters' Approved" Explosion Proof motors protect life and property in explosive atmospheres.

Century Motors are available in a complete range of types, in sizes from 1/8 to 400 horsepower. For complete information, see your nearest supply store—or Century branch office.

Century C MOTORS



Century 5 horsepower capacitor type Explosion Proof Motor on an air compressor in a gas repressuring plant.



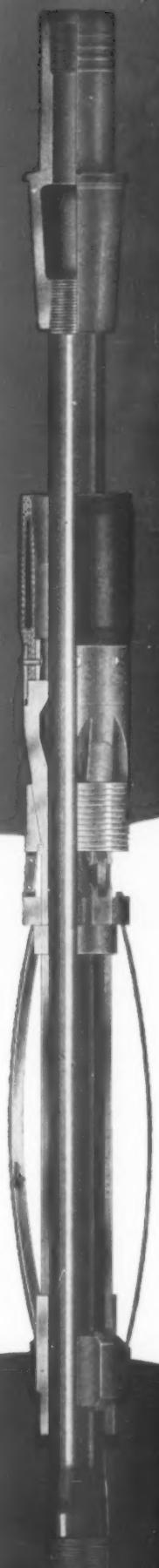
CENTURY TYPE ARC GENERATORS

Where public service current is not available, Century Generators will provide adequate, continuous electric power. Depending on the load per motor and the size of generator, from 10 to 30 wells can be operated from one generator. They provide a dependable source of oil field power.

CENTURY ELECTRIC COMPANY • 1806 Pine St., St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

CE-738



AMERICAN IRON'S

NEW TYPE S

Control Head Packer assures

-POSITIVE SEAL

-POSITIVE SETTING

-POSITIVE RELEASE

AT ANY DEPTH

Once you've used this new Type S Packer, you'll agree that here is the outstanding packer for extremely deep, hazardous wells! For example, even in those difficult off-center wells where the tubing rides the casing wall, this new packer is designed to set, seal and release with dependable, positive action!

You get positive seal because this Type S Packer is equipped with American Iron's specially designed, patented packer cup — used so successfully on all American Iron Packers. Heavy-duty dovetail slips provide positive setting with assured release at any depth! Feature by feature — you'll find that this new Type S Packer is the sum-total of all our many years experience in designing and manufacturing packers!

Send for special TYPE S PACKER BULLETIN now available upon request.

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Which means in our language:

ENGINEERING AND CONSTRUCTION ARE NOW

UNDERWAY FOR A COMPLETE OIL REFINERY

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They Say—

Oversupply Can Be Met . . .

. . . by Limiting Imports

"Had importers been genuinely concerned with the national welfare, our so-called alarming inventory position could have been corrected with cuts in imports comparable to those made in Texas production.

"No lasting solution to the oversupply problem can result from efforts however sincere to share the burden equitably among states when the surplus originates outside this nation.

". . . our executive committee . . . instructed the imports committee to determine whether importers have violated their pledge not to supplant domestic production with foreign oil. It was our unanimous decision that failure on the part of importers to correct the situation immediately will constitute evidence that those companies are unwilling to practice the industry statesmanship of which they boast. We then must reconsider our earlier conclusion that the problem of imports can be solved without congressional action."

M. D. Bryant, president, Texas Independent Producers and Royalty Owners Association, in a statement to the press, Austin.

. . . by Reducing Prices

"The best solution to an oversupply situation such as the oil industry now faces occurs when free market forces bring about a gradual and widespread reduction of prices all the way down the line from the service station to the oil fields. That should result in an increase in consumption, for we know from experience that a lowering of price levels is effective in inducing people to purchase more gasoline and other oil products than they would otherwise buy. And the more we can prevail upon them to buy, the sooner will come the day when demand will equate with our supply capacity.

"A gradual and widespread reduction in prices as dictated by free market forces will benefit the public, proving again how capable the oil industry serves America. It will stimulate our interest in becoming more efficient and in reducing costs, thus strengthening us for the competitive years ahead. It will tend to make the importation of crude oil and products less attractive, thus serving to protect the long-range interest of domestic-oil producers. And

finest in the Field!

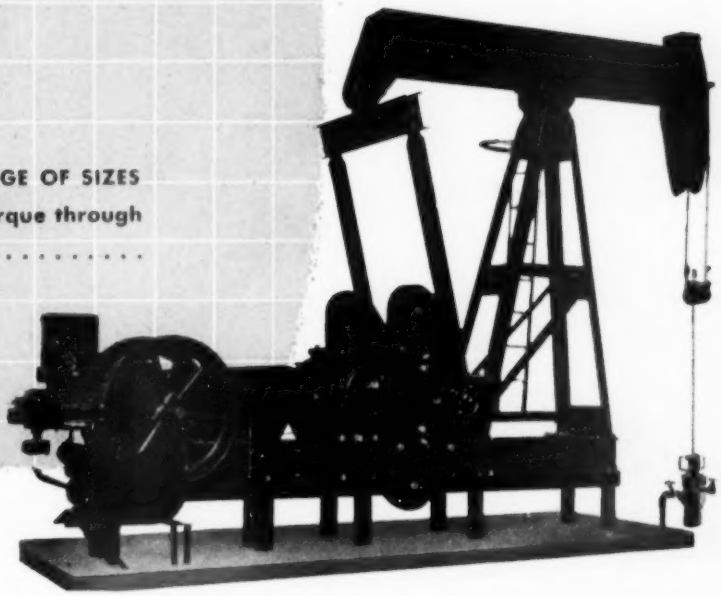
YOU CAN RELY ON UNITED SUPPLY

UNITED SUPPLY

COURTESY • SERVICE • DEPENDABILITY

PUMPING UNITS

AVAILABLE IN A RANGE OF SIZES
from 61,500 Peak Torque through
177,000 Peak Torque . . . . . .



These design features assure years of trouble-free operation . . . . . .

GEAR BOX continuous tooth herringbone gears — proven quality roller bearing thru-out — maintains exact centers trough type lubrication — positive — no stop-ups. Oil reservoir for each bearing — no dry starts — large shafts — minimum deflection.

COUNTER BALANCE:

SMALL UNITS — combination adjustable beam and optional fixed crank weights.

LARGE UNITS — crank balanced — optional economical filler weight type or adjustable type with unique ratchet adjustment feature.

STRUCTURAL COMPONENTS:

SAMPSON POST — four legged braced for rigidity.

BASE — optional elevated gear box for floor clearing cranks.

WALKING BEAM — heavy CB beams — adjustable for alignment — loaded for max. strength.

PITMAN & EQUALIZER — pinned connections for true equalizing action.

HORSEHEAD — rocker connection with beam for alignment. Easily unlatched from beam and polished rod for well servicing clearance.

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PUMPING ENGINES

Because CSCO Pumping Engines are designed specifically for oil well pumping, they are operated more economically. The unique construction of the CSCO embodies four features found in no other engine:

▲ EASY TO START. Safe, too. CSCO Engines now come equipped with starters if desired.

▲ EASY TO SERVICE. No need to stop a CSCO to check oil level, to add oil . . . to check water level or add water.

▲ EASY TO REPAIR. Parts needing repair can be removed with minimum of disturbance to adjacent parts or assemblies.

▲ SMOOTH, STEADY OPERATION. The CSCO is the smoothest running engine for oil well pumping.

Ask a Continental man for full details. He'll show you why CSCO Pumping Engines on your locations will save you dollars!

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above all, it will be in keeping with our philosophy of a free market economy as the necessary foundation for a republic of free people."

Robert G. Dunlop, president of Sun Oil Co., addressing the Petroleum Club, Cleveland.

U. S. Dependent on Imports

"The American nation, comprising slightly over 6 per cent of the world's population and 5 per cent of the world's land area, produces 40 per cent of the world's goods, and in so doing consumes each year 50 per cent of the world's mineral output and 70 per cent of the world's oil production. This accelerating drain of our unrenewable resources has converted us from a nation rich in raw materials to a nation completely dependent on foreign sources of supply for defense-vital minerals.

"Oil and iron ore, regarded for a long time as the touchstones of our self-sufficiency, are being imported in growing quantities to meet our wants. The life insurance companies of America . . . are devoting their energies and resources to the development of new sources of minerals, metals, and oil."

C. W. Dow, senior vice president of the Equitable Life Assurance Society of the United States, in a statement issued in New York.

U. S. Running Out of Fuels

"One reason why economics is often called the dismal science may be that so many of its practitioners belong to the 'disaster-is-just-around-the-corner' school of thought. Engineers, who often fancy themselves as economists these days are increasingly addicted to this same kind of thinking.

"Comes now an engineer consultant to the Government . . . who foresees the possibility that we will run out of 'ordinary' fuels within 70 years, out of 'atomic' fuels within 175 years.

"Of course, it would be fine to tap the vast amount of solar energy that now daily splashes over the earth's surface. But the idea that our existing natural resources—coal, oil, timber, uranium, or what not—are about to be exhausted is borne out neither by the facts of human history nor by human nature itself. The saving factor is the apparently inexhaustible ingenuity of man."

Editorial in the Dallas Morning News.

Williston Basin's Potential Unknown

"The Williston basin is now established as an oil province, but its relative importance as such a province is not yet known and will not be known for a period of years.

"The size of the discovered fields,

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PUMPING UNITS
Think of
ALTEN
including IDECO types

ALL API SIZES

BOTH AT YOUR LOCAL SUPPLY STORE

BOTH MANUFACTURED BY

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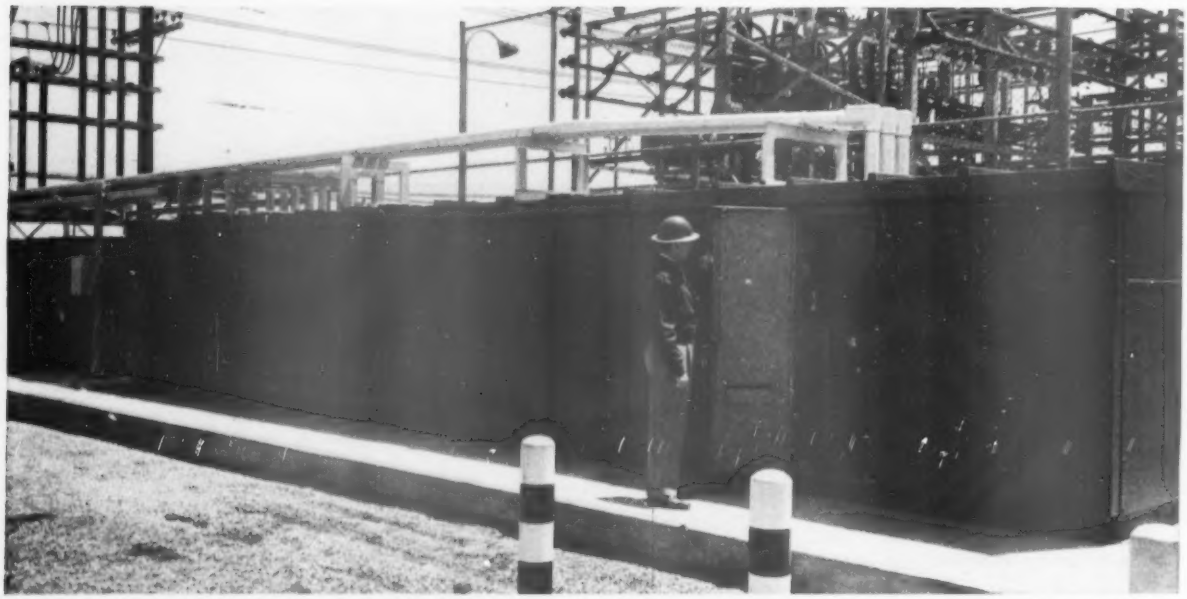
"WORK HORSE" LINEUP of totally-enclosed, fan-cooled Tri-Clad* motors under topping units meet rigid requirements for continuous processing and safety. Cast-iron frame construction helps protect punchings, windings, and rotating parts from dusts, moisture, and hazardous atmospheres. Each motor has a matching explosion-proof push-button station.

*Registered Trade-mark of General Electric Company

System-planned electric equipment



COMPACT, OUTDOOR METAL-CLAD SWITCHGEAR in foreground is the main distributing point of power to Union Oil's Wilmington refinery. Providing primary circuit protection, these compact G-E units are factory-assembled and shipped ready to install. They're simple to operate and maintain because of a fast, vertical-lift system of breaker removal.

TOTALLY-ENCLOSED G-E MOTORS are designed for corrosive and hazardous refinery locations—like these two Tri-Clad units driving transfer pumps outside pumphouse No. 1.

EXPLOSION-PROOF motor starters have cast-alloy enclosures, helps protect against hazards. They are centralized on one rack for easy accessibility and a better distribution system.

helps keep throughput high at Union

CENTRALIZED G-E LIMITAMP CONTROL, located in a non-hazardous area, starts and protects motors driving refinery equipment.

Two new topping units at Union Oil's Wilmington refinery kept on-stream by G-E power and drive equipment

Recently, the Union Oil Company wound up a $27,000,000 expansion program at their Wilmington, Calif. refinery by putting two new 20,000 bbl.-per-day topping units and the nation's largest vacuum flasher into action.

To help maintain this output on a continuous basis, Union Oil and General Electric engineers co-ordinated all drive and power distribution equipment—"system-planned" it—to the plant's specific processing needs.

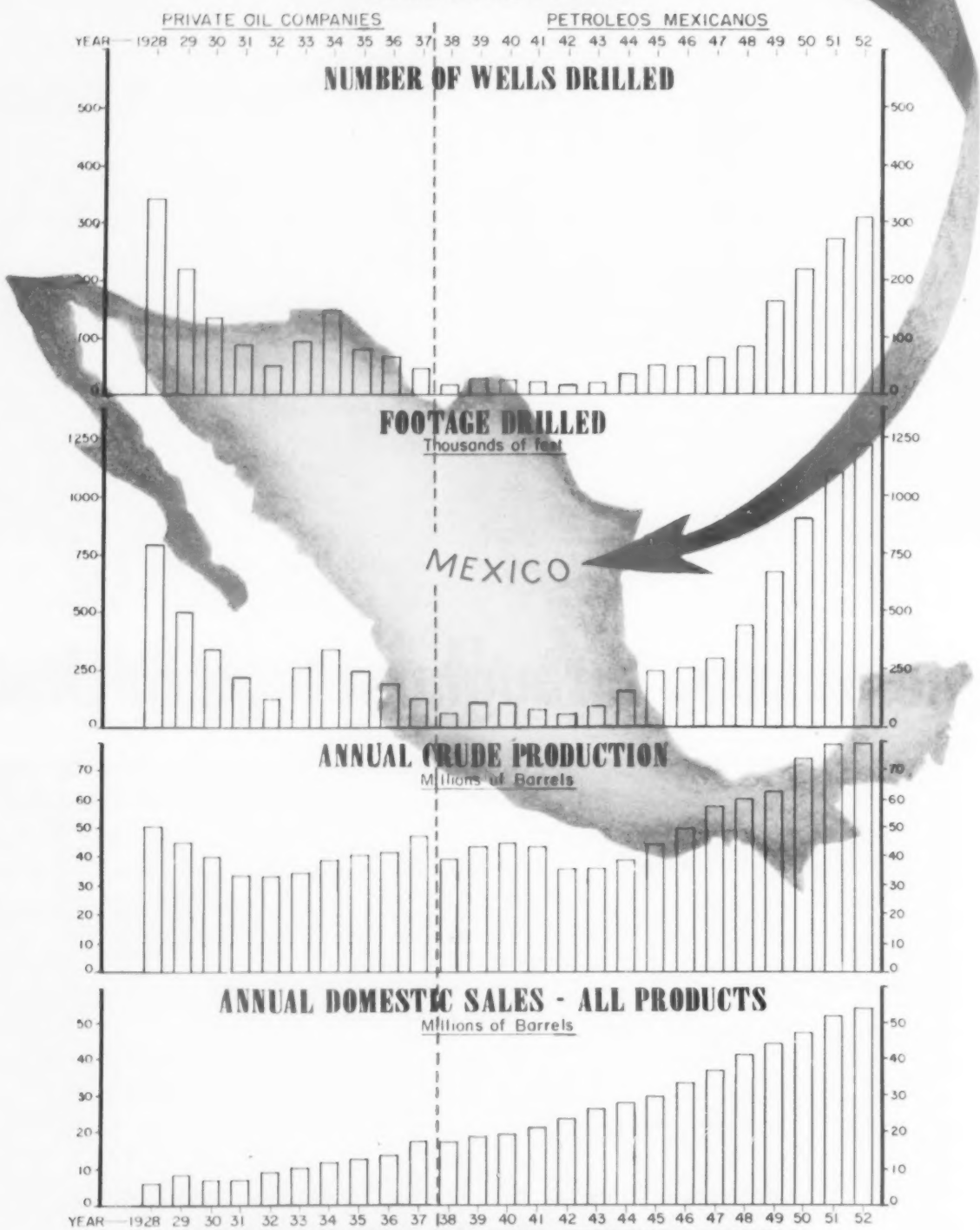
G-E application engineers, experienced in refinery practices, are ready to assist you and your consultants in planning an efficient electrical system.

TO HELP CUT YOUR POWER DISTRIBUTION COSTS be sure to see the new full-color sound slidefilm, "The Vital Link." It's another G-E "More Power to America" program. Ask your G-E apparatus sales representative to arrange a showing. General Electric Company, Schenectady 5, New York. 661-42

Engineered Electrical Systems for Petroleum Refineries

GENERAL ELECTRIC

WHY WE ARE PROUD OF WHAT WE HAVE ACCOMPLISHED



FIGURES SPEAK FOR THEMSELVES

PETROLEOS MEXICANOS

and the amount of recoverable oil in them, is not known and will not be known until a lot more drilling has been done and until these fields have been on production for a period of time to observe their characteristics. In an area of this size, many, many wildcat wells will have to be drilled over many years before the full extent of the oil resources are known. This is nothing unusual, it is true in every new oil province.

"Fortunately, enough time has passed since the initial oil discoveries in this area to develop some factual information, and to be able to evaluate the possibilities on a more realistic basis. The initial glamour has now worn off and the oil industry has settled down to a long pull which is necessary to really discover and develop the oil reserves in the basin."

LeRoy H. Hines, vice president, oil development department, Northern Pacific Railway Co., addressing the Security Analysts of San Francisco.

New Orleans Becoming Oil Capital

"New Orleans has, for the last several years, been establishing itself as the oil capital of the Mid-South.

"The port of New Orleans, second only to New York in total volume of foreign commerce, is a tremendous factor in attracting oil companies and other industrial firms to the city. Crude oil and petroleum products account for an approximate 60 per cent of the port's total tonnage. The Intercoastal Canal serves New Orleans and Louisiana very well. To our oil-transportation people, it is equivalent to a 12-in. pipe line operating at full capacity day in and day out."

Sam H. Casey, general manager of purchases, Pan Am Southern Corp., addressing the New Orleans Board of Trade.

Taft-Hartley Law Makes Headway

"No other law in a field of controversial human relations has achieved such a marked degree of accomplishment as the Taft-Hartley law in 6 years.

". . . the will of the people today is that our basic labor law should not be materially changed."

Charles M. Brooks, labor attorney for The Texas Co., addressing the annual meeting of Texas Personnel and Management Association, Austin.

Oil Is Indispensable

"Oil is indispensable to our way of life; it is indispensable to our present standard of living; it is indispensable to our national security; it is indispensable to the future progress of our

WECO...the UNIONS you can trust for Sealing and Service

Selected Raw Materials

Advanced Manufacturing Practices

Ball and Cone Seat

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Heavier Wall Sections

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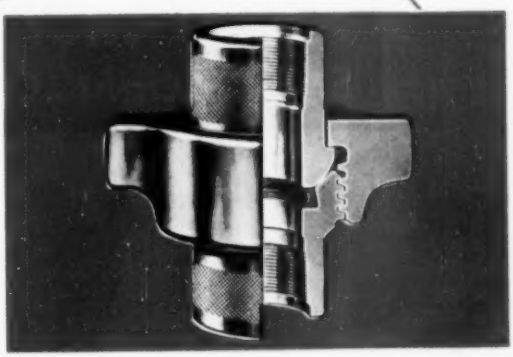

Precision Seating Surfaces

• The unequalled sealing ability of WECO Unions is assured by the smooth finish of these Ball and Cone Seating Surfaces of the male and female subs.

• The first and foremost requirement of a union is its ability to hold a leak-proof seal. And, in this respect, WECO Unions are unexcelled.

Perfect seating surfaces are essential to a perfect seal. Even the slightest imperfection means a leak. That's why we at WECO put so much emphasis on accuracy and precision in machining the seating surfaces of WECO Unions. They must not have the slightest imperfection . . . must be perfectly matched and smoothly finished . . . must fit perfectly at the line of contact and be capable of sealing, even after repeated make-up and break out.

Automatic machining, plus rigid inspection, assures that every WECO Union has the precision seating surfaces that you can trust for perfect sealing and service in every oil industry application.

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It's Wise to Standardize with... WECO ...

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Brea, Calif. Chicago 28, Ill. Newark 2, N. J.
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WILLSON
Kover-Mor goggles
Strong...Light...Comfortable

For Weldors ▸

Willson *Spatterproof*® cover glass protects *Willson-Weld*® filter glass against pitting. (*Note* four indirect ventilating ports admit ample air but keep out sparks and flashes)

Style CW-70

Style CC-70

◂ For Chippers

Willson *Super-Tough*® lenses are heat-treated for impact resistance. (*Note* four screened eye cup ports admit air to keep lenses fog-free)

Kover-Mor Welding and Chipping Goggles fit easily over larger-frame prescription glasses—use standard 50 mm. round lenses—offer these other new Willson developments:

1. Lightweight nylon offers *highest strength/weight ratio* known for goggle cups; non-flammable; won't conduct heat

2. External screw caps permit *easier lens* changing—no springs or clamps to remove

3. Standard 50 mm. round lenses make it unnecessary to stock odd-size replacement lenses

4. Extra ventilation is provided by slots in screw caps plus ports in cups

5. *Rigid metal top bar* makes Kover-Mor Goggles easier to handle; keeps them firmly in place

Ask your Willson distributor for new Kover-Mor* Welding or Chipping Goggles — strongest lightweight goggles you can get — or write for new bulletin.

Easy to get anywhere!

*Trademark

More Than 300 Safety Products Carry This Famous Trademark

WILLSON®

Established 1870

WILLSON PRODUCTS, INC., 204 Washington St., Reading, Penna.

nation's progress in all directions. We may talk about harnessing the atom or the sun as future sources of energy, but a realistic people must conclude that the increasing demand for replacement and multiplication of muscular energy with mechanical energy must place major dependence upon oil or gas if 'life' as we know it is to continue."

P. C. Spencer, president of Sinclair Oil Corp., addressing the Baltimore Oil Industry Information Committee.

CALENDAR OF EVENTS

NOVEMBER

9-11 Geological Society of America, annual meeting, Royal York Hotel, Toronto, Ont.

9-12 American Petroleum Institute, annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

12-13 Society of Exploration Geophysicists midwestern meeting, Adolphus Hotel, Dallas.

19-20 National Association of Corrosion Engineers, western region, fall conference, Biltmore Hotel, Los Angeles.

19-20 Annual Instrument Short Course, Los Angeles Harbor Junior College, applied technology division, Wilmington, Calif.

20 Natural Gasoline Association of America, regional meeting, Herring Hotel, Amarillo, Tex.

Nov. 29-Dec. 2 American Society of Mechanical Engineers, Statler Hotel, New York City.

DECEMBER

1- 4 Corrosion conference, University of Oklahoma, Norman.

13-16 American Institute of Chemical Engineers, annual meeting, Hotel Jefferson, St. Louis.

JANUARY

11-15 Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Statler Hotels.

12-14 National Constructors Association, annual meeting, Hotel Commodore, New York City.

FEBRUARY

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

1- 5 American Society for Testing Materials, spring meeting, Shoreham Hotel, Washington, D. C.

3- 5 American Petroleum Institute, Division of Production, Southwestern district, Rice Hotel, Houston.

4- 5 American Gas Association, transmission and storage conference, Jung Hotel, New Orleans.

8-10 American Institute of Chemical Engineers, Statler Hotel, Washington.

17-19 American Petroleum Institute, Division of Production, Mid-Continent district, Skirvin Hotel, Oklahoma City.

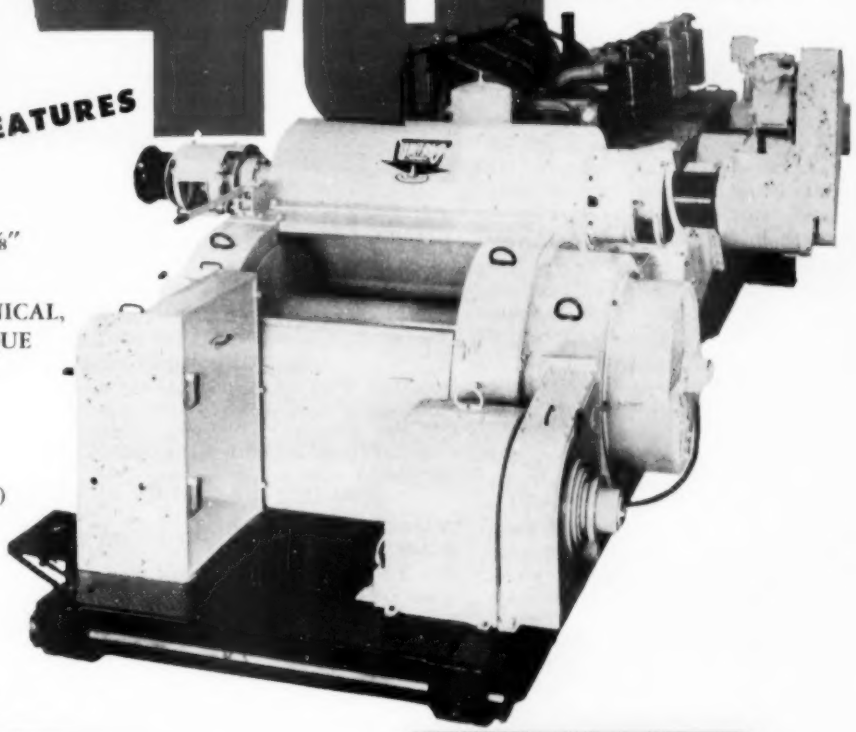
UNIT RIG'S *NEW*

U-40

Already a favorite with Drilling Contractors

CHECK THESE FEATURES

- Extra large main drum — 49⅛" long x 22" diameter barrel.
- Available for direct MECHANICAL, FLUID COUPLING or TORQUE CONVERTER power drives.
- Six forward and two reverse speeds for drum and rotary table. (Four speeds for Torque Converter application.)
- UNIT RIG AIR-O-MATIC Friction clutches.
- Hydromatic brake with flow control and dump valve, enclosed in main case.
- Directed oil bath lubrication.



FOR DRILLING in the 7,000-10,000 foot range YOU NEED A U-40. This versatile draw works is designed for 600 to 900 H.P. engine applications. Get the facts on the U-40. Write for catalog today.

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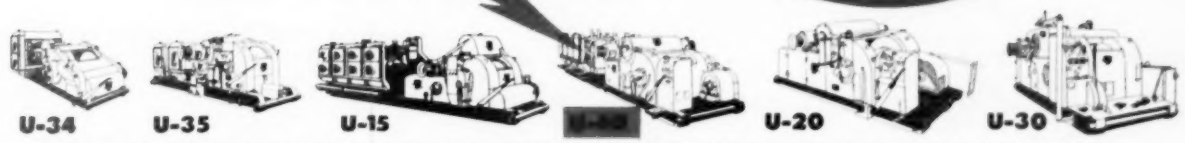

U-34 U-35 U-15 U-40 U-20 U-30

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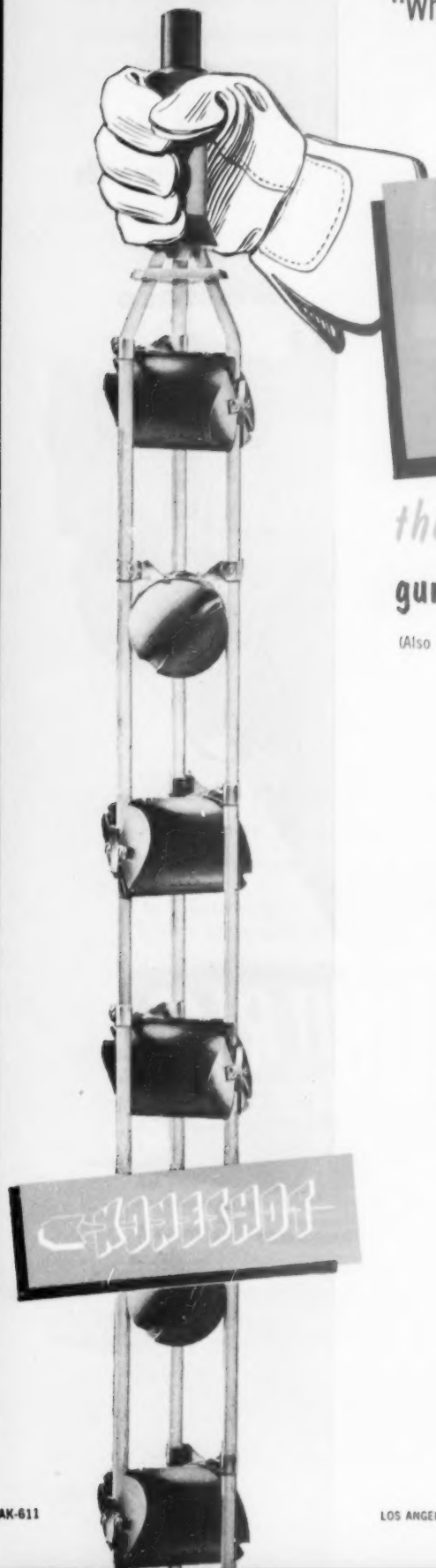
"Why, you could pick the whole thing up with one hand!"
(but we don't handle Koneshot guns that way)



It's Lane-Wells New G-3 KONESHOT Gun

the lightest, strongest, safest, surest

gun for shaped-charge perforating in open hole

(Also in casing when extreme penetration and hole size are more important than casing condition.)

NO DEBRIS to choke the hole... the G-3 gun disintegrates into tiny fragments, which scour the hole, but cannot interfere with operation of the well.

RIGID TUBULAR FRAME insures *exact* shot positioning ... no chance of the gun bending to angle the shots out of line.

CHARGES cased in cast iron and explosive cord protected in aluminum tubes mean positive firing of *all* charges... well fluids, pressures or high temperatures can't cause missed shots or misfires.

SAFEST because with LANE-WELLS safety system the gun is never live till it's in firing position. *Also* safest because of the safety pull-out head.

Available with 3 different sizes of KONESHOT charges. G-3 guns give 120° shot pattern, with shots 6 inches apart vertically, or farther apart, if desired, in any pattern.

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THE OIL AND GAS
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TULSA, OKLAHOMA

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JOURNALLY Speaking

Framed

A WHILE ago we bragged about our big, new pipe-line map, 'lowing as how it was a superfine job and a valuable extra dividend to our readers. We pointed out that it had gas lines on one side and oil lines on the other, and suggested that if you had to use both you could buy an extra copy.

Comes now a satisfied customer with a helpful suggestion. Writes he: "I am having a frame made out of 2-in. batting stock with a ¼-in. mortise on one side of frame so as to hold two pieces of glass with map between, and then a small quarter-round tacked in mortise space to keep glass and map within. By a long hanging wire placed close to ceiling, one may pull frame a short ways from wall and turn map around, thereby having use of both sides."

That's how much he values our map. We assume he has no patent on this device, so you can use it too, if you want. But if that's too much trouble, just send our Reader Service Department $2 for a second copy.

Allowable Confusion

WHAT does "allowable" mean? The dictionary says it's an adjective, meaning permissible. But the oil industry uses the word as a noun (oil men are always making nouns out of adjectives and vice versa, a situation which Webster treats with silent contempt).

As an oil noun we thought that allowable meant the amount of oil that a state would produce during a given period. We knew that the method of setting allowables might vary somewhat from state to state, but we thought that barrels were barrels and allowables were allowables.

But look what happened in two adjoining states recently. Kansas set its October allowable at 300,000 bbl. per day, but at the same time it ordered a 10-day shutdown of most of its wells, thereby cutting the permissible production way below the allowable. Then for November Kansas *reduced* its allowable to 295,000 bbl. per day but lifted the shutdown to permit production to *increase*.

Just across the line, Oklahoma set its October allowable at 485,000 bbl. per day but permitted actual production close to 520,000 bbl. per day that month. For November Oklahoma set the *same* allowable (485,000), but cut allocated fields 10 per cent, thus *reducing* the permitted production.

So in one state producers are not permitted to produce as much as they are allowed in one month but in the next month they are allowed to produce all that is permitted, while in the other state they are permitted to produce more than allowed in one month but not permitted to produce as much as allowed the next month.

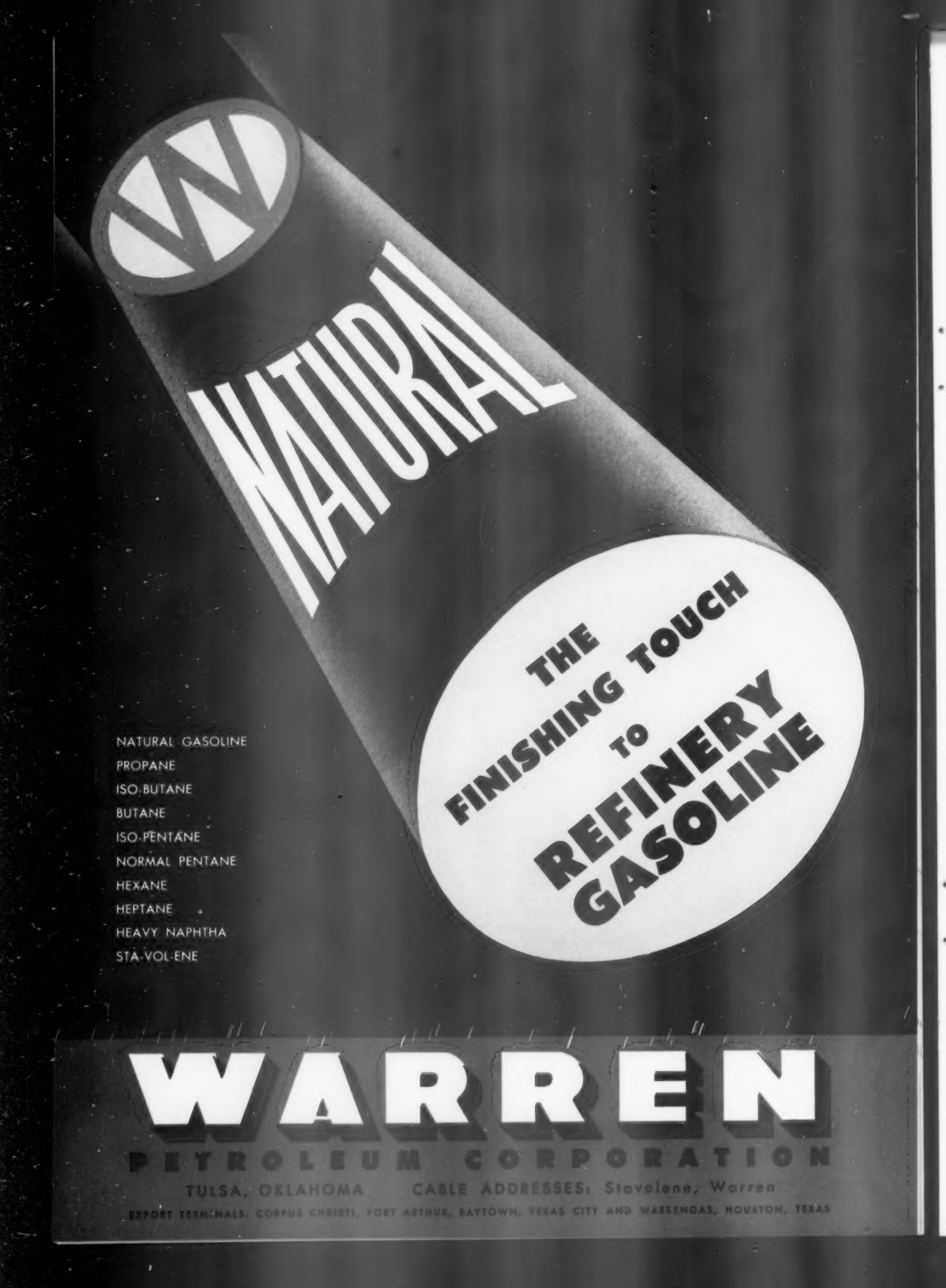
Wait a minute; have we got that straight? Let's try again. First the permissible production is lower than the allowable, but lowering the allowable raises the permissible. On the other hand, when the permissible gets above the allowable, no change in the allowable reduces the permissible.

No, that doesn't quite make sense either. No wonder Webster doesn't give a definition for "allowable *(noun)*". We give up. With such a state of affairs perhaps our confusion is allowable. If you're confused too, write your Congressman.

Alphabet Soup

LOOKS as though refiners will soon be selling alphabet soup instead of gasoline. First, one oil company made a big splash about motor fuel containing TCP, which, as near as we can get it, stands for try cherry phosphate, or tricycle phosphate, or something like that. Then another started adding something identified as RTG. Now a third is advertising that its gasoline contains ETC, which is the abbreviation for etcetera and means more of the same. We hear rumors that envious other refiners are about to go additive-crazy and are frantically searching the dictionary for suitably mystifying initials.

—Henry D. Ralph.


NATURAL
THE FINISHING TOUCH TO REFINERY GASOLINE
NATURAL GASOLINE
PROPANE
ISO-BUTANE
BUTANE
ISO-PENTANE
NORMAL PENTANE
HEXANE
HEPTANE
HEAVY NAPHTHA
STA-VOL-ENE
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EXPORT TERMINALS: CORPUS CHRISTI, PORT ARTHUR, BAYTOWN, TEXAS CITY AND WARRENGAS, HOUSTON, TEXAS

Cold weather won't offset cold facts

IT'S a common fallacy, frequently heard these days, that "a good, cold winter would fix us up." It seems to be a popular escapist feeling to believe that a cold winter would burn up excessive stocks, permit high domestic production, and take the threat out of imports.

It just isn't so. The difference between an extremely cold winter and a normal winter is a difference of about 1 to 1.5 per cent in the over-all demand for petroleum products in this country, averaged over a year. This is a variation so small as to be within the margin of error of anybody's forecast of demand. It is much too small to correct the present oversupply of crude oil.

Approximately 2.5 per cent of all production for the past 12 months has gone into increased inventories. No conceivable cold wave could offset in a few months the effects of a year of excessive production and imports.

IT is true that a hard winter in the northeastern states makes suppliers hump in that area and draws hard on local stocks of heating oils. But refiners are prone to boost their runs with the first cold wave, thus maintaining high over-all products inventories.

Moreover, any big increase in runs without a drastic shift in refinery yields would build up gasoline stocks tremendously—and at a time when bad weather was curtailing motoring. Gasoline stocks right now are 18 per cent above this time last year and they were considered too high then. Gasoline is the money crop, and its market largely determines the price of crude.

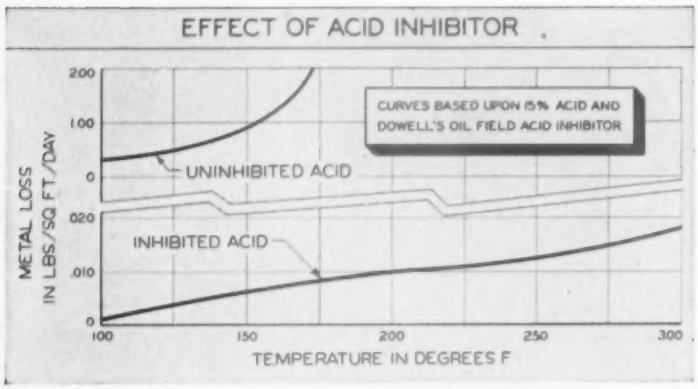
A terrifically cold winter might force refinery runs some 200,000 bbl. per day above normal for a few months, though the present size of products stocks suggests that there would be quite a time lag before this happened. There would be an even greater lag before the cold was reflected in increased demand for crude at the lease tanks.

Even so, the increased crude requirements of a severe winter, when spread out over an entire year, would be somewhere in the neighborhood of 75,000 to 100,000 bbl. per day. This is about 10 per cent of the estimates of shut-in crude capacity in this country. It is less than the month-to-month fluctuations in allowables in some states recently. It is less than the forecast rate of increase in imports during the winter months.

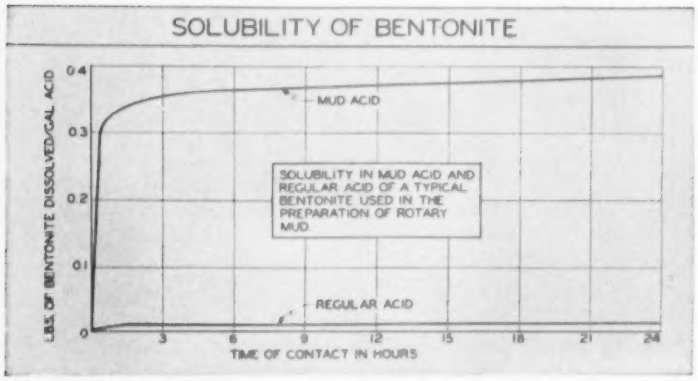
NO, Old Man Winter can't be relied on to wipe out the industry's problem of oversupply. The cold fact is that we have more oil—in storage, en route from abroad, and producible at domestic wells—than consumers are likely to use. The only way to correct this is for the industry itself to make the indicated adjustments in supply.

MORE FOR YOUR MONEY...

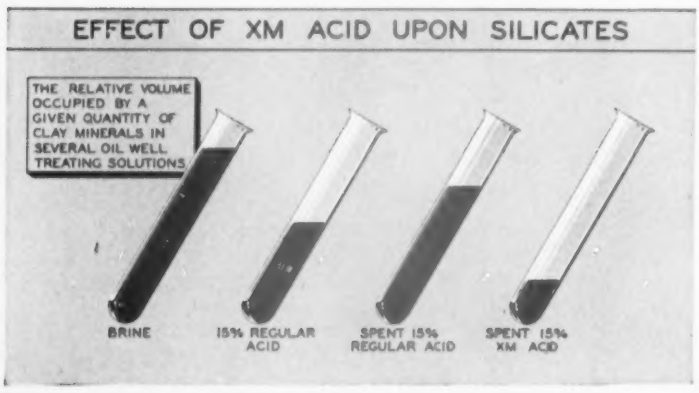
Let Dowell Fit Acidizing to Your Specific Well Problem



Dowell inhibitor permits high-temperature acidizing, and retards the rate of corrosion on well equipment to the point where acid damage is not at all apparent.



Ordinary commercial bentonite, such as is used in the preparation of drilling muds, is many times more soluble in Mud Acid than it is in regular acid.


EFFECT OF XM ACID UPON SILICATES
THE RELATIVE VOLUME OCCUPIED BY A GIVEN QUANTITY OF CLAY MINERALS IN SEVERAL OIL WELL TREATING SOLUTIONS
BRINE
15% REGULAR ACID
SPENT 15% REGULAR ACID
SPENT 15% XM ACID

This drawing illustrates the swelling-control effect of XM Acid on silicates. The same quantity of silicates has been placed in each of four different solutions.

Acid Corrosion? Ask for *Dowell X*—Corrosion of tubing, packers and other well equipment can become especially important in acidizing wells with high bottom hole temperatures. The Dowell inhibitor used in oil well applications reduces metal loss to approximately .01 lb. per sq. ft. per day at temperatures as high as 200°F., with less loss at lower temperatures. Some inhibitors considered highly effective will display corrosion rates at least 10 times greater.

Removal of Mud? Ask for *Dowell Mud Acid*—Dowell Mud Acid is used to remove mud sheaths and to acidize certain dolomite and sand formations. It also provides a superior method of removing mud from critical areas prior to squeeze cementing. Mud Acid is designed to dissolve bentonite and similar silicate materials.

Silicate Swelling? Ask for *Dowell XM Acid*—Certain dolomite and limestone formations contain silicates which can swell during acidizing and actually block formation pores. XM acid is designed to control such swelling. XM acid treatments have shown greater increases in production, less emulsion and easier return of the spent acid.

Faster Acid Action? Ask for *Dowell XX Acid*—This acid contains an intensifier to increase the reaction rate on dolomitic formations. Dowell XX acid is also designed to provide greater solvent action on other formations.

Easier Acid Injection? Ask for *Dowell XF Acid*—This acid contains a chemical to reduce surface tension, thereby increasing the penetrating and wetting abilities of the acid. Addition of the F agent aids in the return of the spent acid and permits treatment of relatively fine pores.

Oil Emulsions? Ask for *Dowell XW Acid*—An agent is added to this acid which helps to prevent the formation of emulsions and aids in the breaking of emulsions that have already been formed.

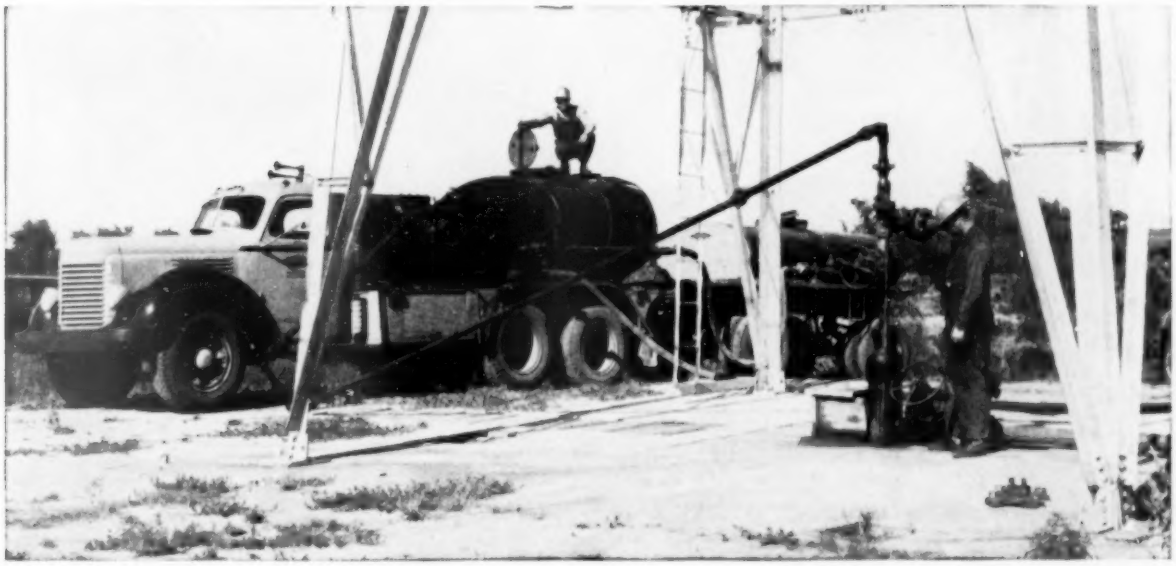
Remove "Gyp"? Ask for *Dowell XG Acid*—This acid contains a foaming agent which is helpful in removing "gyp" from tubing or the face of pay.

Tracing Agent? Ask for *Dowell XC Acid*—A special agent, used in XC acid, enables engineers to tell spent acid from formation water. Spent XC acid has been found in nearby wells. Migration to other formations higher or lower in the well has also been traced.

Other problems? Dowell uses a wide range of other treating services, chemicals, products and tools, including: Jel X materials, Sandfrac, Heavy Acid, Hot Acid, Securaloy Removal, Blanket, Soap Seal, Jelly Seal, Jelflake®, Temporary Plugging Materials, Temporary Fillers, Paraffin Solvents, Triple Zone Acidizing Tools, Compressors, Bridge Plugs, Jet Guns and Packers.

DOWELL ACIDIZING SERVICE

Wide Range of Dowell Addition Agents and Treating Techniques Permits Fitting Acidizing Service to Your Well



Are you getting the most profitable results possible from your acidizing jobs? Let Dowell fit the treatment to your problem . . . as they did for this operator:

In an area where treatments with regular acid had never given a potential of more than 100 barrels of oil per day, a Dowell engineer recommended using the improved M agent for silicate control. The XM acid treatment resulted in a potential of 300 BOPD!

The key to successful acidizing is in selecting the *right* acid and treating technique for the job. As formations vary, so must the methods in order to get the best results. Dowell offers a wide range of addition agents, tools and techniques designed to make treatments more effective. These have been developed in the field and in Dowell laboratories during more than 20 years of acidizing experience.

When you need acidizing, be sure to get your money's worth. Dowell has the experienced engineers, the specialized equipment and the widest range of formation tailored treating solutions available.

There's a Dowell office near you . . . call them today.

MORE INFORMATION?

For detailed information on any of the Dowell Services, drop a card to Dept. K-11, Tulsa 1, Oklahoma. Be sure to mention the particular service in which you are interested.

DOWELL SERVICE

Acidizing • Fracturing • Electric Pilot • Perfojet
Paraffin Solvents • Bulk Inhibited Acid • Jelflake®
Corban® • Chemical Cleaning for Heat Exchange Equipment

DOWELL INCORPORATED • TULSA 1, OKLAHOMA
A Subsidiary of The Dow Chemical Company

"First in Oilfield Acidizing . . . Since 1932"

Look to **DOWELL**

FOR OIL INDUSTRY CHEMICAL SERVICE

Those Not-So-Small Details

● Placing the measuring line over the sheave is one of the small details that mean a lot in a safe, successful cementing job. There are many parallels in producing cements to meet the wide range of conditions encountered in the oil fields today.

One of these is the ritual of cleaning and checking laboratory apparatus before each test. Every detail counts, in controlling quality to assure dependable performance, even under the highest pressures and temperatures in deep, hot wells.

Careful attention to all the not-so-small details is the Oil Man's assurance of the properties needed for a first-class cementing job.

SELECT CEMENT TO FIT THE JOB

LONE STAR CEMENT CORPORATION

Offices: DALLAS • HOUSTON • ABILENE, TEX. • NEW ORLEANS • BIRMINGHAM • KANSAS CITY, MO. • ALBANY, N.Y. • BETHLEHEM, PA. BOSTON • CHICAGO • INDIANAPOLIS • NEW YORK • NORFOLK • PHILADELPHIA • RICHMOND • ST. LOUIS • WASHINGTON, D.C.

Standard Oil Co. (N. J.) Photo

THIS WEEK... ...IN THE NEWS

HOTTEST SPOT in the entire West Texas-New Mexico Permian basin currently is Lea County, New Mexico, and this is one of the reasons. These eight heavy-duty drilling rigs are drilling in the Denton multipay field in the east-central section of the county. Denton field has 12 active rigs out of 112 in the West Texas-New Mexico portion of the basin. Magnolia has just completed one 600-bbl. Denton field well and has eight under way. Shell has two wells under way, Texas Crude Oil Co., one, and Ralph Lowe, one.

DRILLING—Fishing job halts drilling at 21,482 ft. on Ohio Oil's deep test in Paloma field, California. . . . Whether well will be drilled deeper is undecided pending recovery of fish and analysis of latest core. . . . ¶Commonwealth continues productivity tests at prospective oil discovery in Dade County, Florida, 40 miles west of Miami. . . . Well may give state its second oil field. . . . ¶Richardson & Bass set new drilling depth record for Southeast New Mexico and West Texas with 1 Harrison-Federal in southeast Eddy County, New Mexico. . . . Testing now under way at 16,705 ft. . . .

PIPE LINES—A combination of three firms will build the military Alaskan pipe line from Haines to Fairbanks, Alaska. . . . Scheduled for completion in September 1955, the line is designed to give military bases in Alaska's interior an assured supply of fuels. . . . ¶Washington eying alternative methods of supplying the East Coast with crude in case of war because neither the oil nor gas industry has shown interest in building a super-inch pipe line. . . . ¶South Carolina Natural Gas Co. starts construction of 160 miles of lines from Aiken to Columbia and Charleston. . . .

PRODUCTION—Water-soluble detergent additives increase recoveries in water-flood projects by as much as 26 per cent, laboratory tests indicate. . . . Hot-water injection increases permeability of Pennsylvania sands by 10 to 40 per cent. . . . ¶Deep Valley Petroleum Co., Inc., is absorbed by San Juan Exploration Co., Dallas. . . .

REFINING—Construction under way and proposed to start soon will add 175,000 bbl. daily to the refining capacity of the West Coast, including British Columbia. . . . Another construction program in California will give state's refineries 160,000 bbl. of new and improved process facilities. . . . ¶Pan American Refining Corp.'s new 30,000-bbl. catalytic cracker dedicated at Texas City. . . . New unit will produce more than 9,000 bbl. of high-octane blending stock daily. . . .

INDUSTRY—Thousands of oil men from all over the country converge on Chicago for thirty-third annual meeting of American Petroleum Institute. . . . ¶H. B. Gernert, outgoing president of Rocky Mountin Oil and Gas Association, creates sensation at group's annual meeting by reversing his earlier stand to advocate proration for Wyoming and Colorado. . . . Changed conditions cited as responsible. . . .

TRENDS—Total demand for all oils in October is estimated at about 7,900,000 bbl. daily compared with 8,087,000 bbl. daily last year. . . . The increase of about 4 per cent in demand for gasoline was more than offset by decreases for all fuels. . . . Distillate demand was off more than 10 per cent from last year. . . .

ACTIVITY—Production of crude and lease condensate averaged 6,186,300 bbl. daily for week ended October 31, up 191,050 bbl. daily from the revised total for preceding week. . . . ¶Total well completions for the week decreased 3 wells to 1,075. . . . ¶Wildcat completions dropped 15 wells to 217. . . . ¶Rotary rigs operating in the United States increased 25 rigs for week ended November 2 to 2,721. . . .

FRANK M. PORTER
Fain-Porter Drilling Co.
President

L. S. WESCOAT
Pure Oil Co.
Board Chairman

JOHN G. PEW
Sun Oil Co.
Vice Pres., Production

JOHN W. NEWTON
Magnolia Petroleum Co.
Vice Pres., Refining

R. M. BARTLETT
Gulf Oil Corp.
Vice Pres., Marketing

P. C. SPENCER
Sinclair Oil Corp.
Vice Pres., Transportation

B. BREWSTER JENNINGS
Socony-Vacuum Oil Co., Inc.
Treasurer

LACEY WALKER
American Petroleum Institute
Secretary

These Officers Will Direct Activities as . . .

Annual A.P.I. Meeting Opens Today

CHICAGO.—This city became an oil town practically overnight as more than 6,000 oil men, executives and technical experts converged on Chicago for the biggest single oil industry meeting of the year—the thirty-third annual meeting of the American Petroleum Institute.

Sessions of the meeting will be divided between the Conrad Hilton Hotel and the Palmer House during the 4-day industry get-together.

The meeting opens with group sessions Monday, November 9, and continues through the final general session Thursday, November 12. As in years past, the various A.P.I. divisions and committees will be occupied with scores of independent meetings on the varied problems of the industry throughout the 4 days.

There will be 14 separate group sessions on research, public relations, refining, marketing, production, transportation, lubrication, safety and fire protection, and finance and accounting. The two general sessions are scheduled for Wednesday and Thursday, November 11 and 12.

Speakers for the general sessions will include outstanding men from government and the financial world in addition to industry leaders. Speakers from outside the industry will include the Secretary of the Interior Douglas McKay, Oklahoma Gov. Johnston Murray, Mutual Life Insurance Chairman Lewis W. Douglas, Chase National Bank Chairman John J. McCloy, and W. L. Davidson, director of the Office of Industrial Development of the U. S. Atomic Energy Commission.

Industry speakers at the general sessions will include Frank M. Porter, A.P.I. president, and P. C. Spencer, president of Sinclair Oil Corp.

These Men Head Standing A.P.I. Committees

R. B. McLAUGHLIN
Texas Pipe Line Co.

B. G. CRANE
Du Pont

T. W. NELSON
Socony-Vacuum Oil Co., Inc.

DONALD P. JONES
Sun Oil Co.

GEORGE E. CANNON
Humble Oil & Refining Co.

MILAN G. ARTHUR
Union Oil Co.

G. T. DOUGHERTY
Standard Oil Co. (Ind.)

STANTON K. SMITH
Smith Oil & Refining Co.

. . . And These Will Preside at Meeting Sessions

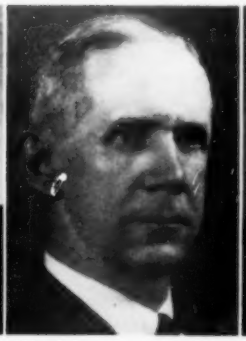
H. S. M. BURNS
Shell Oil Co.

B. I. GRAVES
Retired

SIDNEY A. SWENSRUD
Gulf Oil Corp.

JOSEPH P. WALSH
Sinclair Oil Corp.

JAKE L. HAMON
Independent



ALFRED JACOBSEN
Amerada Petroleum Corp.

N. C. McGOWEN
United Gas Corp.

ROBERT E. WILSON
Standard Oil Co. (Ind.)

Speakers at the A.P.I. Meeting . . .

. . . Fifteen group sessions, two general sessions will highlight thirty-third annual meeting in Chicago. Addresses to range from technology to public relations and government.

C. E. BEECHER
Cities Service Oil Co.

WARREN L. BAKER
World Oil

MEN who will address the thirty-third annual meeting of the American Petroleum Institute in Chicago this week are shown on these pages.

Most of them will present papers on aspects of the industry's technical operations in the group sessions beginning at 9:30 a.m. Monday and continuing through Wednesday morning. Others will address general sessions on Wednesday and Thursday.

The program appeared in The Oil and Gas Journal, October 19, on page 94.

C. CLARK BLEDSOE
Midwestern Constructors

J. W. BOYD
Phillips Pipe Line

H. S. M. BURNS
Shell Oil Co.

L. C. BURROUGHS
Shell Oil Co.

CHARLES A. CHAYNE
General Motors Corp.

WILLIAM L. DAVIDSON
Atomic Energy Commission

LEWIS W. DOUGLAS
Mutual Life Ins. Co.

GEORGE F. DOWNS, JR.
Phillips Petroleum Co.

J. E. DYER
Sinclair Refining Co.

SAMUEL H. ELLIOTT
Standard Oil Co. (Ohio)

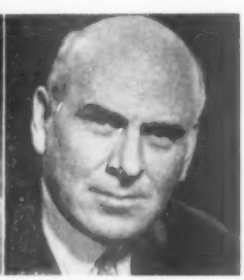
RICHARD HEFLEBOWER
Northwestern University

DR. W. V. HOUSTON
Rice Institute

CHARLES S. JONES
Richfield Oil Corp.

DONALD P. JONES
Sun Oil Co.

H. Z. MARTIN
Standard Oil Dev. Co.



JOHN J. McCLOY
Chase National Bank

DOUGLAS McKAY
Secretary of the Interior

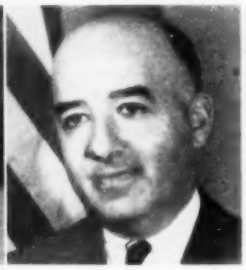
VALENTINE MEKLER
Lummus Co.

FRANK D. MERRILL
New Hampshire

CLARENCE L. MOODY
Ohio Oil Co.

O. C. MUDD
Shell Pipe Line Corp.

JOHNSTON MURRAY
Governor of Oklahoma



ROBERT B. MURRAY, JR.
Commerce Department

MORRIS MUSKAT
Gulf Oil Corp.

O. A. OHMANN
Standard Oil Co. (Ohio)

CLAYTON L. ORN
Ohio Oil Co.

J. P. PATTERSON
Pan Amer. Pet. & Trans. Co.

A. W. PEAKE
Standard Oil Co. (Ind.)

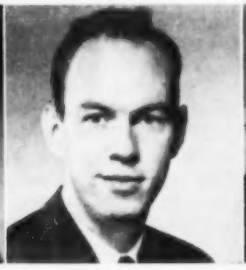
JOHN V. PENNINGTON
Drilling Research, Inc.

LON J. PUTNAM
Gulf Oil Corp.

JOHN E. SHERBORNE
Union Oil Co.

A. A. STAMBAUGH
Standard Oil Co. (Ohio)

JOHN R. SUMAN
Standard Oil Co. (N. J.)



GEORGE R. TAIT
Phillips Petroleum Co.

REESE H. TAYLOR
Union Oil Co.

ALEXIS VOORHIES, JR.
Esso Standard Oil Co.

JOSEPH P. WALSH
Sinclair Oil Corp.

GODFREY W. WELSCH
Dallas

T. T. WHIPPLE
Lummus Co.

W. K. WHITEFORD
Gulf Oil Corp.

ROBERT E. WILSON
Standard Oil Co. (Ind.)

D. V. STROOP
Director of Technical Services

F. R. COVERN
Director of Statistics

H. B. MILLER
Director of Information

J. H. BIVINS
Director, A.P.I.C.

The A.P.I.—What It Is, What It

IF a study were made of the influence of various factors upon the growth of the petroleum industry and the advancement of its technology in the past 30 years, the lion's share of the credit would inevitably lie with the American Petroleum Institute.

The work of this organization has been vital in the spectacular transformation of a duke's mixture of oil personalities and activities into an industry with gross assets currently in excess of $40,000,000,000, a figure exceeded only by the farming, banking, and utility investment.

In a broad sense, the Institute is like a large university—a great educational center and clearing house for petroleum history and progress. Thousands and thousands of oil men have contributed to its success. Aside from administrative functions, its work is done largely by volunteers. The results that have been achieved are striking examples of what can be accomplished cooperatively in an industry known for the intensity of its competition.

Policy . . . The A.P.I. came into existence March 20, 1919. It was established as an outgrowth of the National Petroleum War Service Committee of World War I to continue in peacetime as much of its wartime cooperation as could be conducted within the framework of the law.

Its objectives, as set forth in its charter, are: (1) To afford a means of cooperation with the Government in all matters of national concern, (2) To foster foreign and domestic trade in American petroleum products, (3) To promote the interests of the industry generally in all its branches, and (4) To promote the mutual improvement of individual members of the industry and of the study of the arts and sciences connected with it.

By edict and policy, the Institute does not concern itself with controversial or competitive matters. Its studies and work are limited to those things which are for the mutual good of the industry and on which there is mutual agreement. It does not study or discuss prices, for example, since these are regulated entirely by competition and by supply and demand.

The A.P.I. does not "represent" nor serve as spokesman for the petroleum industry. It is, however, representative of the United States industry, since its members are scattered throughout the country, represent both major oil companies and small independent firms, and are engaged in almost every enterprise having to do with petroleum.

Organization . . . A.P.I. policy is set and guided by the board of directors and its executive committee. Membership of the board of directors currently totals 129, from which 30 are elected to serve with seven of the Institute's officers as the executive committee. Directors are elected at the annual meeting for a 2-year term. The chairman of the board is elected for a 1-year term and can be reelected only once. The other officers including the president, secretary-treasurer, assistant treasurer, and the vice presidents of production, refining, transportation, and marketing also are elected for 1-year terms. For these offices there is no limitation on number of reelections.

The activities of the Institute are administered, under the supervision of the president, by a paid staff which acts as the service organization and working force for the board of directors and its executive committee. Staff directors head each division and service department including the production, refining, transportation, and marketing divisions, the department of information, statistics, and technical services, and the American Petroleum Industries Committee.

The major part of the work is conducted through the Institute's hundreds of working committees and subcommittees, whose thousands of members represent the best talent in all of the industry divisions. In general, the Institute assigns no activity to a working or functional committee unless it previously has been proposed and urged by oil men interested in the problem and unless substantial sentiment for such an activity has developed within the industry.

If a project is approved by the board of directors or its executive committee, a committee of oil-industry experts is set up. Once committees or subcommittees are activated they remain in existence until there is no longer any need for them.

Activities . . . A.P.I. committees are actively pursuing investigations aimed at furthering the oil industry in an amazing number of directions. The projects come under the broad classifications of standardization, design, care, and correct usage of equipment; engineering and technology; fundamental research; safety and fire protection; protection of petroleum facilities; waste disposal; testing methods and specifications; measuring, sampling, and testing; nomenclature; metallurgy; corrosion prevention; pipe-line, highway, railroad, and water transportation; radio facilities; fuels and lubricants; agriculture; aviation; vocational

W. H. STRANG
Director of Production

W. T. GUNN
Director of Refining

JAMES E. MOSS
Director of Transportation

JOHN W. FREY
Director of Marketing

Does . . .

and personnel training; education and public relations; finance and accounting; statistics; petroleum reserves; taxation, legislation, and regulation.

One of the A.P.I.'s largest and most far-reaching activities is its industry-wide public-relations program, which is implemented by the Oil Industry Information Committee. More than $700,000 yearly is poured out by the Institute for fundamental research.

Achievements . . . Probably the one most striking thing about the A.P.I. is that through its vast committee structure, and the regional, divisional, and annual meetings, the working knowledge of many oil companies—jealously guarded secrets in most industries—is shared regularly with the entire petroleum industry, the interested government agencies, and the public generally.

These intra-industry discussions, and the ever-higher standards established by the committees, have saved the industry and the public many millions of dollars. Unquestionably, they have hastened by years the adoption of many new techniques which have made possible the rapid advances of the industry in the past 30 years.

Some of the more outstanding A.P.I. achievements have been:

. . . **Recommendation** of equipment-standardization programs which have received world-wide acceptance and have taken the chaos out of the production, pipe-line, and refining fields.

. . . **Setting up** of recommended safety and fire-protection practices, which have minimized the danger element in field and plant operations and in the handling of flammable gasoline, oils, and other volatile fluids.

. . . **Issuance** of statistical reports on industry operations, which are available long before the government statements.

. . . **Maintenance** of informational services which answer thousands of inquiries yearly and publish numerous historical, factual, and technical pamphlets and booklets about the industry.

. . . **Establishment** of a recommended uniform system of accounting practices.

. . . **Yearly estimation** of proved reserves of crude oil in the United States.

Standardization . . . The Institute's greatest single accomplishment is generally conceded to have been the standardization of oil-field equipment.

In the old days, threaded connections for the same sizes of oil equipment often didn't fit if the parts came from different manufacturers — and sometimes even if they came from the same manufacturer. Today, it is possible for a driller in some remote portion of the world to order component parts of a drilling rig from manufacturers in 15 different countries and know that they will mesh perfectly.

Industry leaders have remarked time and again that if the A.P.I. had accomplished nothing else in its 3 decades, its production standards and specifications, have more than justified its existence.

Standardization was discussed at the Institute's first meeting in 1920, and the board of directors authorized the appointment of several committees to work on the problem in 1923.

In May 1924, the Institute hired a young equipment-manufacturing executive as director ofthe Division of Standardization, which later became the Division of Production. This was Carl A. Young, who retired last July as division director.

The central committee on standardization of oil-field equipment was organized to govern all standardization activity in 1925. First chairman of the committee was the late J. Edgar Pew, then vice president of Sun Oil Co. He was succeeded in 1946 by John R. Suman, vice president of Standard Oil Co. (N. J.).

The Institute directed that work of the committee should be concerned with the preparation and publication of specifications and recommended practices on all major items of equipment used in oil production. The general objectives were: (1) simplification of sizes, grades, and designs; (2) standardization of dimensions which affect interchangeability; (3) stabilization and improvement of quality; and (4) development of economical practices for care and use of equipment.

It has been estimated that this standardization program has saved the industry more than $50,000,000 each year. By 1928, due to the efforts of the committee during its first 5 years of existence, the number of sizes of cable-tool joints were cut from 306 to 11, sizes of derricks from 200 to 11, and rotary drilling taper joints from 200 to 7, to name just a few.

Today there are 487 manufacturers in the United States and 133 foreign firms licensed to stamp the A.P.I. monogram on their drilling equipment —meaning that the equipment measures up to rigid A.P.I. specifications.

The standardization committee currently includes 11 major subcommittees, each responsible for specifications and recommended practices in its field. Equipment covered includes belting, boilers, cable-drilling equipment, derricks and masts, tubular goods, valves and fittings, rotary-drilling equipment, wire rope, oil-well cement, production equipment, and oil-storage tanks. Individual items range in size from ¾-in. sucker rods and 1¾-in. working-barrel cups to 300,000-bbl. storage tanks.

History . . . The Institute was founded March 20, 1919, chiefly due to the

efforts of four men: A. C. Bedford, chairman of the board of Standard Oil Co. (N.J.), who since has been called the "Father of the A.P.I."; Mark L. Requa, war-time head of the Oil Division of the U. S. Fuel Administration; Thomas A. O'Donnell, director of the Government's Production Division; and Robert L. Welch, secretary of Western Petroleum Refiners Association.

All were members of the National Petroleum War Service Committee which functioned so well during World War I with Bedford as chairman. The entire membership of the 40-man NPWSC became the A.P.I.'s first board of directors.

O'Donnell who was president of The California Petroleum Corp., was elected first president. Welch, a former Iowa lawyer and counsel for the independent jobbers in that state, was named staff and administrative head.

Registration at the first annual meeting in Washington in 1920 was 420. Conclusive evidence of the success of the A.P.I. was last year's thirty-second annual meeting in Chicago when more than 6,400 oil men registered and attended 160 separate meetings.

INDUSTRY AFFAIRS

Synthesis Switch

Carthage Hydrocol owners expected to write off huge plant as total loss; Stanolind is top contender to take it over

IT appeared certain at the week end that all owners of the huge Carthage Hydrocol, Inc., gas-synthesis plant at Brownsville, Tex., will write off their investment and turn the plant over to the Reconstruction Finance Corp.

It was reliably reported in New York last week that two holdouts, Stone & Webster, Inc., and Forest Oil Corp., will announce early this week that they have decided to join the seven other owners in writing off their investment, clearing the way for the RFC to take over the plant and negotiate an immediate transfer to a separate company, probably Stanolind Oil & Gas Co.

The $50,000,000 Brownsville plant, designed to convert natural gas into petroleum products and chemical fractions, has never operated at more than a third of its capacity and has been shut down much of the time since it went on stream.

The decision to abandon the project was prompted by prospects that at current operating rates, the project would never pay out. Participating companies were faced with the choice of either investing more money to bring the plant to capacity or writing it off as a total loss.

RFC officials admitted that they have held "discussions" with Stanolind on the company's proposals to take over the plant but declined to elaborate. The RFC holds a first mortgage on the plant in support of an $18,500,000 loan, about $1,000,000 of which has been paid off.

Why Stanolind is interested . . . Stanolind's interest in the plant arises from its $15,000,000 investment in a chemical plant which it built adjacent to the Carthage Hydrocol plant to separate and purify products from a by-product chemical stream taken from the Carthage plant. Stanolind, in turn, sent these alcohols, aldehydes, ketones, and acids to a third plant, operated by U. S. Industrial Chemicals, Inc., for further processing and packaging and marketing.

If the Carthage Hydrocol plant, out of operation this time since early summer, should fail to reopen, the Stanolind chemical plant would be regarded as a white elephant of considerable proportions.

According to present plans, Stanolind would take over the Carthage Hydrocol plant, assume the RFC loan, and invest enough additional money to enable the plant to reach capacity operation, provided that the present owners write off their investment and get out of the picture.

Concurrence of all owning companies in the plan would speed up the transfer process by eliminating the need for foreclosure proceedings by the RFC or bankruptcy action by the operating company.

The process . . . Carthage Hydrocol was designed to yield daily 6,000 bbl. of gasoline, 900 bbl. of diesel oil, 200 bbl. of fuel oil, and 300,000 lb. of chemicals.

In its processing, Carthage required about 280,000,000 cu. ft. of air daily. This was compressed and cooled to —275° F. to separate and recover the oxygen. The oxygen was then used under carefully controlled conditions to burn 90,000,000 cu. ft. of natural gas daily. Product of this controlled oxidation was a synthesis gas, a mixture consisting predominantly of carbon monoxide and hydrogen.

The synthesis gas then entered a catalytic converter where the gas components were reacted under certain conditions to produce various petroleum hydrocarbons and aliphatic chemicals.

The reactor effluent stream was split into hydrocarbon and chemical streams. The coproduct chemical stream then was transferred to the Stanolind plant, where it was refined into pure chemical products. The hydrocarbon fraction was separated into the various product streams by conventional oil-refining processes.

It is estimated that roughly $18,000,000 would be required to bring the plant to capacity operation. However, more gas reserves will have to be added, since it is understood that gas consumption per gallon of product will be higher than originally anticipated and, too, reserves originally committed did not develop as great as originally thought.

New gas will cost much more than that bought under the original contracts, but this cost is expected to be justified by the proposed arrangement under which the plant would be acquired by an outside company.

Ownership . . . When the company was formed in 1945, this was the division of stock ownership: The Texas Co., 37.9 per cent; The Chicago Corp., 4.1; Forest Oil Corp., 10.3; Hydrocarbon Research, Inc., 10.7; La Gloria Corp., 8.2; Niagara Share Corp., 10.3; Stone & Webster, 7.2; United Gas Corp., 8.2; and Western Natural Gas Co., 3.1.

The initial sale of stock netted only $167,750. Bulk of the money for the plant came from 6 per cent promissory notes of the participating companies. Within the past 2½ years, however, additional investment of $19,500,000 became necessary and was contributed by individual companies, notably The Texas Co., which as a result increased its percentage of ownership to a little more than 48 per cent.

Total investment in the plant is $49,316,000, including the RFC loan, company investments, and $2,500,000 advance made by Stanolind for the chemical stream.

Background . . . Pilot-plant work on the chemical process used by Carthage Hydrocol was done in the research department of Stanolind in its Tulsa laboratories. Among others also doing work on the development of the process were Hydrocarbon Research, Texaco, and Standard Oil Co. (N. J.).

Better Flood Recoveries Seen

- **Addition of water-soluble detergents may boost sand production by 26 per cent**

- **Injection of hot water increases permeability of Penn Grade sands by 10 to 40 per cent**

K. B. Barnes

STATE COLLEGE, Pa.—Laboratory tests conducted in an effort to improve water-flood oil recoveries indicate that the use of water-soluble detergent additives may increase recoveries by as much as 26 per cent.

Tests show 0.1 wt.-per cent solutions of 16 polyoxyethylated non-ionic detergents displace 1.15 to 1.33 times as much oil from synthetic oil-sand samples as water.

The average amount of oil displaced from 30 grams of synthetic oil sand by distilled water was 1.43 ml. or 63 per cent of the total crude present. The average amount of crude displaced from corresponding sand samples by the 16 detergents, however, was 1.81 ml. or 79.7 per cent of the petroleum present.

Data for these detergent additives as tested in laboratory experiments using a new and rapid centrifugal displacement method, were disclosed by Dr. H. N. Dunning and Lun Hsiao during a 12-paper program for the Seventeenth Technical Conference on Petroleum Production, Penn State College, held here October 28-30. Dunning and Hsiao are with the U. S. Bureau of Mines, Petroleum Experiment Station, Bartlesville, Okla.

Improvement of water-flood oil recoveries had the emphasis throughout the program. Some of the reports gave results for laboratory experiments with detergents as water-flooding additives, some for "surfactant" floods, and others for hot water treatment of wells to increase water intake rates.

Dunning and Hsiao pointed out that, of the wide variety of additives tested, water-soluble detergents have shown the most consistent effectiveness in increasing petroleum recovery. These detergents commonly are effective in lowering the tension at the oil-water interface and in promoting the wetting of solid surfaces by an aqueous phase.

Dunning and Hsiao prepared a synthetic "oil sand" by mixing 2 kilograms of 40-70 mesh sand with 135 grams of 39° gravity crude oil.

The synthetic oil sand was placed in a centrifuge tube having a small-diameter calibrated neck. The tube then was filled with the detergent solution. Triplicate tests were made, with one of the tubes containing distilled water as a standard. After centrifuging, the amount of oil displaced from the sand was measured directly in the calibrated neck.

Water-drive efficiencies . . . Dunning and Hsiao define the term "displacement efficiency" as the amount of oil displaced from a sand by a detergent solution, relative to the amount displaced from corresponding sand samples by distilled water. (See table.)

The average displacement efficiency for 0.1 wt.-per cent solutions of 54 non-ionic detergents tested was 1.24 while the range in efficiency was 1.02 to 1.38. The average displacement efficiency for 0.1 wt.-per cent solutions of 20 anionic detergents tested was 1.09.

Although the anionic detergents were generally inferior to non-ionic types, the "heavy-duty" anionic detergent formulations, such as Tide, the Nacconols, and Ahcol 350 were as effective as the average non-ionic detergent. Only a few cationic detergents were tested. Of these, only the Ethomeens were effective in displacing petroleum from sand. Th Ethomeens tested had only moderate cationic tendencies. The major part of the study by Dunning, Hsiao and co-workers was centered on non-ionic detergents.

The loss of detergent by adsorption at solid-liquid interfaces and the dilution of detergent solutions by connate water have caused serious doubt that detergents can be used economically as water-flooding additives. However, considerations of the chromatographic theory show that it should be possible to cause a "zone" of detergent to move through the producing formation. This theory originally was developed to explain and predict the movement of "bands" or zones of colored substances through adsorbent columns as the result of flowing a solvent through the columns. Recently the chromatographic-theory has been applied by J. C. Calhoun, Jr., to the movement of detergent zones through porous media. The movement of these zones occurs by a continuing process of adsorption and desorption. In effect, this process would allow repeated use of the original quantity of detergent.

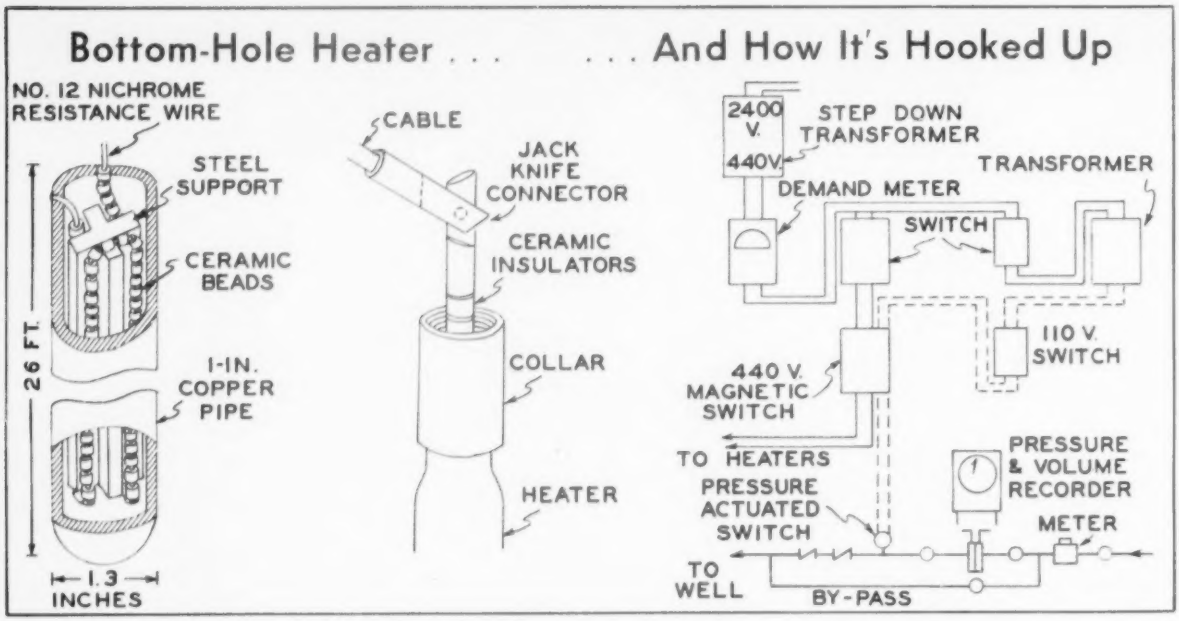
The applicability of the chromatographic theory to the prediction of detergent-zone movement and shape was tested experimentally by Dunning and Hsiao. Theoretical considerations showed that for Igepal CO-630 the ratio of zone movement to flood movement through the porous medium used should be about 0.3 at a concentration of 400 p.p.m. This detergent and the others studied would be expected to form zones that were self-sharpening at the leading boundary and diffuse at the trailing boundary. Experimental results were in general agreement with predictions.

Hot water injection . . . because of the very low permeability (1 to 10 md.) of much of the oil sand in the Bradford (Pa.) field, water injection rates are low and consequently the rate of oil recovery is low.

Some years ago a natural born ex-

Water-Drive Efficiencies of Polyoxyethylated Detergents

Detergent—Manufacturer—Hydrophobic constituent	Displacement efficiency
Emulphor ON-870, General Dyestuff Corp., oleic acid (ether)	1.24
Emulphor EL-719, General Dyestuff Corp., castor oil (ester-ether)	1.26
Ethofat C/25, Armour & Co., coco fatty acids (ester)	1.30
Ethomeen 18/20, Armour & Co., stearyl amine	1.28
Ethomid HT/25, Armour & Co., hydrogenated tallow amide	1.26
Ethomid C/25, Armour & Co., coco amide	1.15
Ethomid RO/25, Armour & Co., red oil amide	1.26
Igepal CA-630, General Dyestuff Corp., alkyl phenol	1.28
Igepal CO-710, General Dyestuff Corp., alkyl phenol	1.28
Lissapol N-380, Arnold Hoffman & Co., alkyl phenol	1.33
Lubrol W., Arnold Hoffman & Co., fatty alcohol	1.24
Dispersant NI-W, Oronite Chemical Co., alkyl phenol	1.29
Nonic 218, Sharples Chemicals, Inc., tert. dodecylthioether	1.29
Synthetics B-79, Hercules Powder Co., alkyl phenol	1.28
Synthetics B-48, Hercules Powder Co., rosin (ester)	1.30
Tween 80, Atlas Powder Co., sorbitan mono-oleate (ester-ether)	1.21
Average	1.265



perimenter named Kenneth Barton, who was working for Forest Oil Co. in the Bradford fields, decided to see what could happen if very hot water was injected into a well for awhile. He rigged some gas burners under the water line going to an injection well and turned on the gas. He heated the water so hot that the straw in the water box which came into contact with the pipe caught on fire. The intake rate of the well increased considerably during the period of hot water injection. When the heating was stopped and the well was allowed to cool, the intake rate did not return to its former value but remained 100 per cent higher. Due to the danger involved in the method employed to heat the water, the experiment was discontinued and apparently forgotten.

The incident was reported by Dr. J. N. Breston and B. R. Pearman, in a paper from the Bradford Laboratory of the Pennsylvania Grade Crude Oil Association, which has been experimenting with various means of increasing water intake rates.

In laboratory experiments, radial core specimens were flooded with cool water to an equilibrium value, then with hot water, then again with cool water. The experiments showed that definite increases in water intake rates were effected by hot water flooding. The effect did not take place until water temperature of 140° to 170° F. were reached, and then continued to increase with each increase in temperature. The experiments were not carried above 250° F. Permeability increases ranged from 10 to 400 per cent.

The results appeared so convincing to Dr. Breston and coworkers that they decided to go right to the field with further experiments. In that way tests could be carried to higher pressures and temperatures.

The heating of the injection water was done at the bottom of the well, accomplished by a bottom hole electric heater (see figure).

The test procedure consisted of observing the well's equilibrium intake rate before installing the heater, after installing the heater, during hot water injection, and after hot water injection. In the case of two of the three wells tested, no cleaning or other operations were performed prior to running the heater. In the third test the well was cleaned with sodium hypochlorite solution. There were at least two periods of hot water injection for each well with sufficient time between to determine the cold water injection rate.

The results obtained confirmed those obtained in the Bradford laboratory as well as those obtained in the field by Kenneth Barton, however, on a much reduced scale. The increases in intake rate were of 11 to 28 per cent.

Dr. Breston pointed out the injection rate increase might be due to modification of some of the cementing materials in the sand, as permeability of limestones have been increased by heating them in water to moderate temperatures while under high pressure.

Distilling With Burrs

Revolutionary new column packing material features metal strips with burred holes for more capillary action

STATE COLLEGE, Pa. — A new packed-type distillation column with high flood rate, high efficiency, and a high percentage of free space is now being installed in petroleum refining laboratories because of a chance remark to a classroom by a Penn State chemical engineering professor.

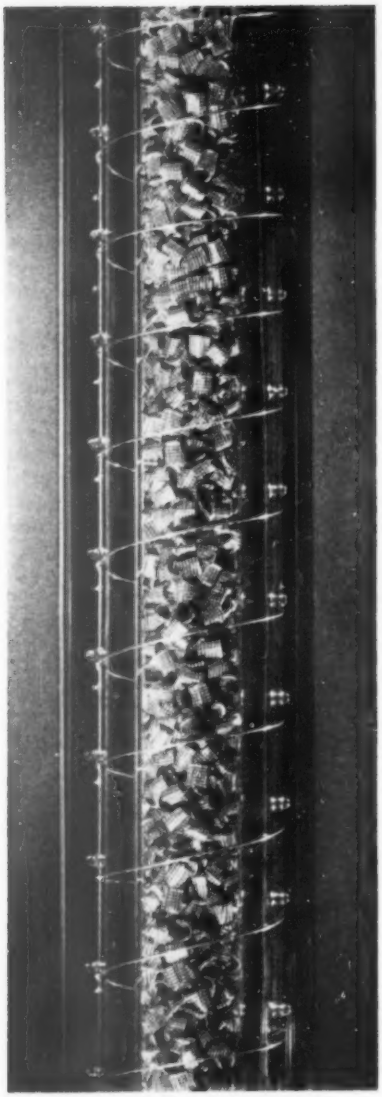
In addition to its use in laboratory work, the new column is being employed commercially in chemical plants in diameters up to 16 in. It is possible with the new packing to get 40 theoretical plates with a packed height of only 6 ft. under vacuum operation.

Dr. M. R. Cannon, Penn State distillation expert, designed the new column packing after a classroom remark about the uphill flow of liquids directed his serious thinking toward capillary effect and distillation columns.

Preliminary experiments revealed the soundness of his first attempts to find a packing material and design to achieve the capillary effect he desired.

Burr, or protruded packing . . . The search turned to ways of manufacturing cheaply at high production speeds, an object with high capillary effect and large wetting area. Porous media had these requirements, but not good vapor flow-through, or permeability.

Dr. Cannon's answer finally came in



1,024 HOLES PER SQUARE INCH . . . and each hole has burred edges which create an enormous liquid-vapor contact area. This photograph is of a 1-in. diameter distillation column filled with the new "protruded packing."

punching an enormous number of small holes in thin plate, and curving the plate into small semicylinders which remain separated on packing.

Secret of this "punched hole" is the burr on the back of the plates. These burrs, tightly grouped due to the closely spaced holes, create high capillary effect, just as two needles will do when held close together.

This "burr capillary" and the resulting "protruded" packing grew into Dr. Cannon's U. S. Patent 2,602,651 and the Scientific Development Co., which sells the unique column packing.

The protruded packing provides a maximum surface on which liquids and gases can react in a distilling column. The packing is made of nickel or stainless steel ribbon cut in 0.24 or 0.16-in. lengths and curved on one end to prevent excessive interlocking. It has 1,024 holes per square inch, occupies only 4 per cent of the column's volume, and has uniform packed density. Prices start at $24.70 per liter.

Distillation . . . A high free space is especially important in vacuum distillation (for reduction of pressure drop) and in extractive distillation and absorption (where high liquid or vapor loading is common). The new "protruded packing" is excellent in this property, since the free space for the .16 by .16-in. size is 94 per cent and for the .24 by .24-in. size is 96 per cent.

As operating pressure is reduced—more vacuum applied—the efficiency of protruded packing increases. For example, the number of theoretical plates is more than doubled when the condenser pressure is changed from 740 mm. Hg to 10 mm. Hg.

Because of its high percentage free space, the protruded packing has a high flood rate. Food rates at any pressure for the packing can be predicted by the equation:

$$G = 270\,(\rho_1)^{0.5}(\rho_g)^{0.5}$$

where G = Mass vapor velocity in lb. per hour per square foot.
$_1$ = Density of liquid phase in lb. per cubic foot.
$_g$ = Density of gas phase in lb. per cubic foot at average column pressure.

If a strip of the protruded metal is partially submerged in a beaker of liquid hydrocarbon the liquid will crawl quickly up above the submerged part of the metal. This self-wetting, blotter-like property ensures that the packing will stay wet in service and retain high efficiency.

The importance of liquid distributor plates increases as column diameter increases. Dr. Cannon recommends the installation for columns of 2-in. diameter or greater. The design incorporates cylinders for vapor risers and drilled holes for liquid returns.

Florida Well Testing Oil

MIAMI. — Commonwealth Oil Co. and associates are continuing productivity tests at their prospective oil-discovery well, 1 Wiseheart-State, 40 miles west of here in northwestern Dade County, Florida. If commercial production is established, the well will give the state its second oil field.

Late tests by swabbing have resulted in recoveries at the rate of 2.1 bbl. of fluid, 35 per cent oil and 65 per cent salt water, per hour. Tests are in a casing-perforated interval at 11,462-86 ft. in the Lower Cretaceous-Sunniland section, producing horizon of Humble Oil & Refining Co.'s Sunniland field, 40 miles to the west in Collier County and until now the state's only oil field.

What Recession?

California Standard plans record expenditure in '54

SAN FRANCISCO. — Standard Oil Co. of California plans a record expenditure for exploration and plant expansion during 1954.

R. G. Follis, Standard board chairman, said last week that 1954 budget figures have not yet been finally set, but added:

"It appears that these outlays will exceed the $225,000,000 that will be spent for these purposes by the end of this year."

Follis said Standard's largest proposed expenditure next year "will continue to be in exploration for new oil fields in the United States and elsewhere in the Western Hemisphere and the development of proved areas."

"Next largest area of expense," he said, "will be in new refinery plant construction. Some of the most costly refinery units we've ever built will be completed or substantially completed during 1954."

Octane pushed . . . "Foremost in our refinery plans," Follis said, "are the completion of various units to increase the quality and octane ratings of motor gasolines, because we've just about reached the ceiling of large-volume output of high-octane gasoline by use of present equipment and methods. All indications are that fuel requirements of automobiles of the years ahead will place even greater demands on refinery capabilities."

Follis said "several" new chemical units are being added to continue Standard's development of petrochemicals.

The increased spending prediction came on the heels of an announcement by Standard of a dividend of 75 cents a share payable December 10. Estimated net income to Standard stockholders for the first 9 months of this year was $4.89 a share compared to $4.55 a share for the same period last year. The 1953 figure includes a nonrecurring profit of 17 cents a share on a stock sale earlier this year.

Microwave Costs . . .

. . . Run about $1,170 per mile for construction, $105 per mile per year for operation on the average, A.I.E.E. told

John C. Reidel

KANSAS CITY.—Microwave pipeline communication is a lusty infant which is rapidly outgrowing the nursery.

First pipe-line application of microwave equipment was on Keystone Pipe Line Co.'s system which went into operation in November 1949.

Today pipe lines have installed 545 microwave stations that cover about 13,200 system miles. A number of individual systems are 1,000 or more miles in length.

Installation of these microwave systems has cost roughly $17,000,000, E. B. Dunn, Atlantic Refining Co. said here last week at the fall meeting of the American Institute of Electrical Engineers.

"All of these investments," Dunn said, "have been for relatively untested equipment in a service still classified by the Federal Communications Commission as developmental."

Growth problems . . . This rapid growth, particularly in the longer pipeline microwave systems, Dunn said, brought these attendant problems:

. . . Construction costs for erection of towers and other facilities ran higher than was originally estimated.

. . . Difficulty was encountered in coordinating installation of isolated stations on the longer systems and in supplying these stations.

. . . Technical help and skilled labor were hard to obtain.

. . . Installation of standby equipment, a reliable emergency power supply, alarm circuits, and tower lighting was required.

. . . Development of a maintenance routine and a training program for maintenance personnel was necessary.

Costs . . . The present cost of building a representative 1,000-mile, eight-channel system in flat country averages about $1,170 per mile, Dunn said. This estimate resulted from a survey covering 13 pipe lines which reported construction costs ranging from $600 to $1,750 per mile.

The $1,170 per mile estimate is a fair one, Dunn said, but it should be used cautiously since it does not apply to those systems installed in difficult terrain or cities or for "gold-plated installations."

Microwave operating costs are hard to pin down, he said, since such costs depend primarily on the number of maintenance technicians required. The tendency is to give these technicians extra duties in the form of VHF, teletype, electrical, and telemetering maintenance.

For the 13 pipe lines surveyed, however, estimates were obtained ranging from $30 to $240 per microwave-system mile per year "for the typical 1,000-mile system." The average maintenance and operating cost is roughly $105 per year for such a system, Dunn said. To this, he said, must be added a depreciation cost of about $60 per mile per year based on a 20-year average life on an original system cost of $1,200 per mile.

Pioneer systems . . . Dunn described 24 different systems in operation or under construction. These included:

1. Mid-Valley Pipeline Co.'s 1,000-mile system from Longview, Tex., to Lima, Ohio. This system, placed in operation in August 1950, was the first of the long-distance microwave installations.

2. Sunray Pipe Line Co.'s system in Oklahoma — the first application of pipe-line microwave to remote-control operation.

3. Plantation Pipe Line Co.'s 156-mile system, which also was designed primarily for remote control.

4. The 460-mile system now under construction in Pennsylvania by Keystone Pipe Line and Sinclair Pipe Line Co.—the first system designed to serve two independent parallel pipe lines on a cost-sharing, nonprofit basis.

Unattended stations . . . Four unattended pipe-line pump stations have been placed in operation on Plantation Pipe Line's system, according to R. S. Cannon and T. V. Bockman of Plantation. Two of these are controlled remotely over microwave radio while the others are started and stopped over circuits leased from the telephone company.

All four are single-unit stations. Two of them have one 300-hp. vertical centrifugal pump to handle 7,500 bbl. per day at 1,300-psi., the other two have one 800-hp. horizontal centrifugal pump to handle 33,000 bbl. per day at 1,100 psi. pressure.

New devices . . . Among the devices which not only shut down but also lock out the station are a new lock-out trip and alarm actuated by excessive vibration on pump. This, according to Cannon and Bockman, appears to have considerable merit — particularly for unattended stations using ball bearings in either pumps or motors. Another new device is a scraper detector which permits quick passage of a pipe-line scraper past the unattended station. Instead of shutting down the station for perhaps an hour or two, as is conventionally required, it is shut down and restarted automatically, and the whole operation takes only about 2 minutes on Plantation's 4-in. line and about 2½ minutes on the 8-in. line. The device thus makes possible substantial savings in throughput time. It consists basically of coils, forming two inductor type detectors and located on a nonmagnetic stainless-steel spool at the incoming and outgoing station line block valves. An impressed voltage is varied by these detectors as the scraper enters the stainless steel spool by means of the magnetic steel in the brushes and mandrel of the scraper.

Auto Engines Static

S.A.E. octane need survey shows no change 1949-51

CHICAGO.—U. S. refiners may be surprised to learn that octane number requirements of post-war passenger cars did not change between 1949 and 1951.

This was one of several findings reported here last week at the Society of Automotive Engineers National Fuels and Lubricants meeting, by the CFR Motor Fuels Division of the Coordinating Research Council, Inc.

The report compared a 303-car survey conducted in 1952, with one made on 450 post-war cars in 1951. The later survey substantiated the findings in the earlier one. No significant differences in octane requirement exist among cars located in the Eastern, Central and West Coast areas of the country.

The two surveys further showed that maximum knock occurred most frequently in the speed range of 750 to 1,400 r.p.m. The percentage of cars showing maximum requirements above 1,400 r.p.m. increased from 22 per cent in 1949 to 29 per cent in 1951.

Research teams from both the oil and automotive industry coordinated their efforts in the CRC survey. They found the percentage of cars using regular grade fuel which were found knocking was consistently greater than the percentage for cars using premium grade fuel. Limited data indicate, said they, that even after the initial 3,000 miles of operation, maximum

octane number requirement continued to increase for several thousand miles.

The report, entitled "Antiknock Requirements of Passenger Cars—1951-52" was presented by H. W. Best of Yale University, Leonard Raymond of Socony-Vacuum Oil Co., Inc., and R. K. Williams of General Motors Corp. Data for the surveys were contributed by a total of 26 different companies, of which 20 were oil companies.

L.P.G. Fuels Buses

Three city transit companies take advantage of favorable propane-butane prices and report good operating results

CHICAGO.—The use of propane and propane-butane blends for city bus operation received favorable reports here last week at the Society of Automotive Engineers National Fuels and Lubricants meeting.

Transit companies in Chicago, Wichita and San Antonio presented case histories of their experiences with sizable L.P.G.-powered fleets and concluded the advantages generally outweighed the additional precautions and costs of switching from gasoline and diesel buses.

The Chicago Transit Authority has operated 551 propane buses during the past three years and this year ordered 400 more. While numerous problems were encountered during that period, CTA now considers that most have been satisfactorily solved. Along with the precautions which they recommend to others planning conversion of city bus fleets to L.P.G., they pointed to a number of advantages they have experienced.

These included excellent public acceptance and driver appeal, progress in cutting down atmospheric pollution, less frequent oil changes, absence of crankcase dilution, increased spark plug life, elimination of engine knock and decrease in carbon formation.

Most important of all, they cited lower fuel costs. With a favorable 5-year contract for L.P.G. which assures essentially the same price spread between propane and diesel fuel, they compute the cost per 1,000 miles for comparable buses at $37.84 for propane vs. $41.48 for diesel fuel. Experience following 50 million miles of operation leads CTA to conclude that the propane bus is the ideal vehicle for urban transit operation in Chicago.

Wichita . . . Taking economic advantage of an area condition that produces great quantities of propane at low cost, the Wichita Transportation Corp. reported similar fuel savings. Of the 131 coaches operated by that Kansas firm, 91 are equipped to use propane and the remainder are gasoline-fueled. Comparing the operation of 60 gasoline buses in 1949, with 90 propane buses in 1952, they found that they obtained 3.79 miles per gallon of gasoline and 3.44 miles per gallon of propane.

The lesser mileage on propane requires two qualifications. During the winter months, one-third of the propane fleet is stored outside, requiring coaches to be idled continuously. This fuel figures in the averages to the detriment of propane, since all gasoline coaches were housed. A higher percentage of buses in rush-hour service only boosted fuel consumption in 1952.

Even with the mileage differential, the Wichita company showed greater fuel economy on propane with $.03366 per mile vs. $.04237 per mile for gasoline, based on a 16.06-cent price for gasoline in 1949 vs. 11.58 cents per gallon for propane in 1952. In the same comparative study, they reported oil consumption at 323 miles per gallon for gasoline buses vs. 690 miles per gallon for propane units.

The relatively short history of propane bus operation does not provide too much data yet on engine life. In view of this, the company took down one propane engine with 3½ years and 230,000 miles of city bus operation to calibrate the wear of various components. It found cylinder wall wear to be a maximum of five-thousandths, cam shaft wear under one-thousandths, no measurable wear on valve stems with seats in perfect condition, main bearings in the crankshaft at standard, and connecting rods one-thousandths undersize. On the basis of this, the company thinks it not inconceivable that propane engines will run 400,000 miles before rebuilding and perhaps even more.

San Antonio . . . San Antonio Transit Co. agrees with these estimates. Its previous experience with gasoline engines indicated that 175,000 was the maximum to be expected before major overhaul. With an engine running during its life on propane, overhaul mileage may well be 400,000 to 450,000.

Despite the increase in compression ratio and resulting increase in volumetric efficiency with propane engines, San Antonio Transit warns that, because of the lower B.t.u. content of propane and butane, some mileage reduction should be expected compared with gasoline-fueled buses. In its case, and in areas where L.P.G. is available at 5 cents less per gallon than gasoline, greater fuel economy should be obtained from conversion from gasoline to propane buses.

While all three transit companies reported definite savings, they did not boom L.P.G. as a universally superior fuel to either gasoline or diesel fuel for city bus operation. In each case, they took advantage of favorable price situations. In general, they indicated that urban bus operators should investigate L.P.G. in areas of local production, or cities served with pipe-line quantities of that fuel.

ALASKA

Three Firms to Build Line

ANCHORAGE.—A combination of three firms, William Brothers Co., Tulsa; McLoughlin, Inc., Great Falls, Mont.; and the Marwell Construction Co., Vancouver, British Columbia, will undertake construction of the Defense Department's Alaskan pipe line.

The three companies, with a joint bid of $29,001,287.50, were the low bidders on the construction of the 610-mile, 8-in. military products pipe line from Haines to Fairbanks Alaska. The bids were opened October 14 by the Army Corps of Engineers.

The line is scheduled for completion by September 1955 and it is planned to move in equipment and pipe this year so that construction may start as soon as possible. The line is designed to provide a safe, assured supply of military fuel at bases in the Alaskan interior, direct from the seaboard. Part of the line will run through Canadian territory, under agreement with the Canadian Government.

CANADA

Refinery To Be Expanded

PORT CREDIT, Ont.—President R. Rosefield of Trinidad Leaseholds (Canada) Ltd., has announced that its refinery here will be expanded by adding a catalytic reforming unit at a cost of over $1,000,000.

Unit was designed by Universal Oil Products Co. of Chicago, and tenders are now being called, with completion planned for June, 1954. The plant is designed to increase production of high octane gasoline.

Refining Capacity Is Climbing

By End of 1955 Construction Will Add . . .

- 50,000 bbl. daily to California refineries
- 85,000 bbl. per day in Washington
- 40,000 bbl. daily to British Columbia plants
- 160,000 bbl. of "modernization" process facilities

D. H. Stormont

LOS ANGELES. — Refinery expansion programs and new plant construction under way or to be started by mid-1954 will increase West Coast crude refining capacity by more than 175,000 bbl. daily.

The Pacific Northwest — including British Columbia—is the site of most of the new activity. When construction of existing and planned projects is completed in 1955, Washington will have an increase in daily capacity of 85,000 bbl. and British Columbia 40,000 bbl. This will give the area a refining capacity of about 165,000 bbl. by 1955.

Crude charging capacity of California plants will be increased approximately 50,000 bbl. by expansion programs under way or announced for early starting. This capacity expansion work is only about one-third the overall construction taking place in California refineries. Projects designed to improve yields and upgrade products will account for 160,000 bbl. of new catalytic cracking, reforming and similar facilities.

Outlay for California's construction program will be about $240,000,000. If the money being spent for petrochemical manufacturing facilities is included, the total is more than $315,000,000.

California refinery work . . . Largest California project under way is a $43,000,000 expansion and modernization program at Richfield Oil Corp.'s Los Angeles refinery. Major facilities include a 35,000-bbl. fluid cracking plant and a 60,000-bbl. vacuum-distillation unit.

The project will boost the plant's crude capacity 20,000 bbl. to a total of 125,000 bbl. daily. Total gasoline output will be hiked approximately 40 per cent to about 66,000 bbl. daily. Aviation-gasoline production will be tripled to some 12,000 bbl. daily when work is ended next August.

At El Segundo, Standard of California is building a 40,000-bbl. catalytic cracking unit and a 60,000-bbl. residuum stripper. General Petroleum is under way with a 15,000-bbl. catalytic reformer at Torrance. At Wilmington, Shell Oil Co. is nearing completion of distillation facilities which will increase the plant's charging capacity 14,000 bbl. daily. Several plants in this area, and at San Francisco and Bakersfield, have catalytic reforming units under way or contracted for early erection.

Union program . . . Next year Union Oil Co. will start construction on a $40,000,000 program designed to upgrade its products and improve gasoline yield. As the company controls approximately 50 per cent of California's high sulfur-content crudes, much of the outlay will be for processing these stocks.

Bulk of the company's heavy, high-sulfur crudes are located in the Santa Maria area, where its production amounts to about 30,000 bbl. daily. To better utilize these crudes, Union is considering erecting a 20,000-bbl. coking plant at an ocean-front site 10 miles west of Nipomo. Feasibility of the site, near the company's huge Guadalupe heavy-oil reserves, is currently being investigated.

The type of coking process to be used has not yet been decided and probably will not be announced until contracts are awarded after the first of the year.

Another phase of the program calls for the erection of a Unifining plant and sulfur-recovery unit at its Oleum refinery. These units, contracts for which will be announced shortly, will process distillate products tankered from the Santa Maria coking plant.

This will be the first commercial application of the Unifining process, a new name for cobalt molybdate desulfurization. The fixed-bed process converts organically combined sulfur to hydrogen sulfide by contact with the cobalt-moly catalyst in the presence of hydrogen. Pilot plant studies show high yields of substantially sulfur-free products can be obtained from Santa Maria coker distillates and heavy gas oils containing approximately 4 per cent sulfur.

Also included in the project is a 14,500-bbl. catalytic reformer at its Oleum refinery, to be completed by November of next year. At its Cut Bank, Mont., refinery, a 600-bbl. catalytic reformer and other facilities will be added.

Pacific Northwest . . . Completion of the Trans Mountain Pipe Line Co. 24-in. carrier from Edmonton to Vancouver has resulted in Canadian crudes being brought into British Columbia. Currently shipments are small but ultimately this flow may reach 300,000 bbl. daily. It is this new source of crude which is causing the Pacific Northwest to develop into a major refining area, freeing it from dependency on tanker shipments from California plants.

Two large refineries are to be erected in the Puget Sound area of Washington. At Ferndale, General Petroleum Corp. is under way with a $35,000,000, 35,000-bbl. plant. At nearby Anacortes, Shell Oil Co. has let contract for a 50,000-bbl., $75,000,000 plant on which work will be started in mid-1954. Both will be supplied crude through spur lines from the Canadian carrier.

Three plants in the Vancouver area are undergoing expansion. Imperial Oil, Ltd., is well along with an expansion program which will increase daily capacity of its Ioco plant from 12,000 to 34,500 bbl. At Shellburn, Shell Oil Co. of Canada is completing a $10,000,000 program which will result in that plant's capacity being raised from 8,000 to 15,000 bbl. daily.

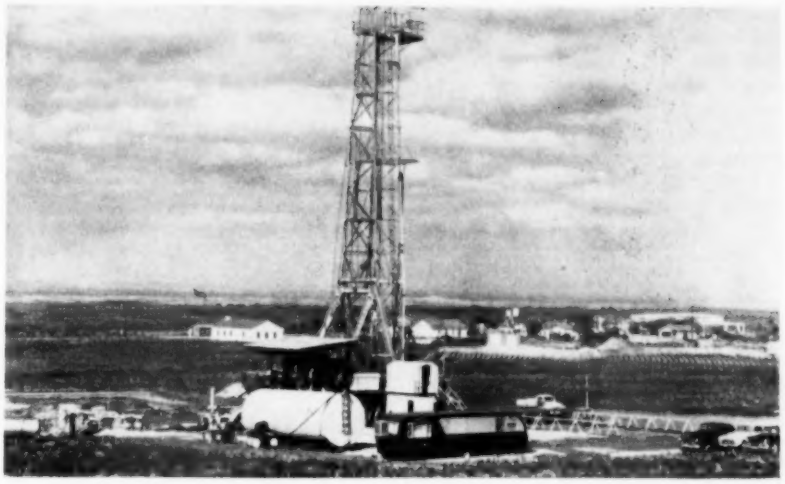
Standard Oil Co. of British Columbia is to spend a like amount in enlarging and modernizing its 8,500-bbl. Burnaby refinery. This project, to be completed late next year, will add 11,000 bbl. of modern processing capacity.

Petrochemical expansion . . . In the petrochemical field, work under way includes two ammonia plants, two

new phenol plants, and a polyethylene plant. Already this year Standard of California has completed benzene and paraxylene units at its El Segundo refinery and a phthalic anhydride plant at the Richmond refinery.

At Richmond the company is nearing completion of a $4,000,000 phenol plant which will have an annual capacity of 35,000,000 lb. of synthetics. Monsanto Chemical Co. also has a phenol plant under construction at nearby Avon.

In December, Shell Chemical Co. will complete a synthetic ammonia plant, of 150 tons daily capacity, near Ventura. Amoniaco Corp. has a 200-ton plant under construction at Brea which will be operating by late next year. The plant will be operated under lease by Brea Chemical Co., a Union Oil Co. subsidiary. Another major petrochemical plant under way is the $36,000,000 polyethylene and ethylene glycol plant of Carbide & Carbon Chemicals Co. at Torrance. Scheduled for completion late next year, the plant is in the early stages of construction.



Townsite Discovery Sets Off Drilling Play

Pennsylvanian reef production is the object of this drilling rig just outside the little town of Vealmoor, in northwest Howard County, West Texas. This operation, a joint venture of Oceanic Oil Co. and Phillips Petroleum Co., offsets Oceanic's discovery, in the background just to the right of the rig, which flowed 1,764 bbl. of oil a day. Four wells have now been completed, one is digging pits, two are drilling, and four locations are staked. Phillips was completing its 1 Reef "A," two locations west of the discovery, after flowing 457 bbl. on a 24-hour test.

Motors Urged in Smog Fight

LONG BEACH. — Latest proposal to combat smog in the Los Angeles area is to substitute electric motors for engines on all pumping wells in the Long Beach Harbor area of the Wilmington field.

Criticism was leveled against the pumping engines by City Councilman Carl Fletcher. At a recent council meeting he stated, "If you get within 15 ft. of any of these machines the smog is so fierce you can't stand it." He suggested motors be used, asserting that the gas thereby saved would be available for future domestic use.

Stuck Pipe Halts Deep Well

BAKERSFIELD.—A fishing job has halted drilling at a depth of 21,482 ft. in Ohio Oil Co.'s deep test at the Paloma field near here.

The operator finished coring a section and was attempting to pull drill pipe when it was found the pipe was stuck. Pipe was backed off after efforts to free it were unsuccessful. Ohio officials feel they have a fair chance of recovering the fish.

What is revealed by the core, if it is recovered, is expected to dictate the well's future. If inspection shows the well is still in lower Miocene shale, drilling may not be resumed. Pipe then would be set to test up-the-hole shows. If fossil life shows the well to be in the Tumey shale of Oligocene age, drilling then probably will be resumed.

Oil Fund Release Pending

LONG BEACH. — Two proposals relative to releasing tideland oil fund money for exploration and development of this city's offshore oil reserves will be submitted to public vote at a special election December 8.

The Long Beach City Council cleared the way recently by approving a proposed charter amendment which would permit unlimited use of these funds for exploration and development. A resolution then was passed which would release $5,000,000 immediately for those purposes.

In another move to speed development of its anticipated huge offshore oil reserve, City Manager S. E. Vickers stated that preliminary contract discussions for a seismic survey are nearly complete.

ROCKY MOUNTAIN

Proration Is Urged

Retiring R.M.O.G.A. president reverses stand, advocates proration of oil production in both Colorado and Wyoming

DENVER.—Depletion, proration and politics held the spotlight at the eighth annual meeting of the Rocky Mountain Oil and Gas Association attended here October 29-31 by more than 1,000 registrants.

Depletion was a scheduled portion of the program. Politics as a matter for consideration was foreseen. Proration fell like a bombshell among the oil men of the Rockies when Hial B. Gernert, outgoing association president from Casper, Wyo., reversed his stand of a year earlier and advocated proration for Wyoming and Colorado.

In a report of association activities which touched on the major problems handled during his year in office, Gernert gave a prominent place to proration. He reminded the association of his former stand against proration of production, then cited the change in conditions responsible for his changed outlook.

Gernert used the Weston County area of Wyoming and the Little Beaver area of Colorado as examples of areas where lack of proration is depriving both state and operators of revenue. Oil in both areas is selling below posted prices, Gernert said. "The independents in Wyoming tell me they are ready for proration," Gernert reported.

"I therefore recommend to the ex-

ecutive committee (of RMOGA) that in the states of Wyoming and Colorado they contact the members of the legislature asking for support of legislation extending the definition of waste under our present law to include 'the production of oil and gas in excess of the reasonable market demand.' "

Gernert told the association Wyoming production is running at about 230,000 bbl. per day and is producing 28 per cent under maximum efficient rate.

"I point this out to the states which have accused Wyoming of increasing production while they are prorating to the present market demand."

Gernert told of 109 different pieces of legislation which the association dealt with in the past year at local, state and federal levels. He rated the association's influence as good during his year in office.

He also warned Rocky Mountain operators that they, too, must be concerned about imports, about regulation of the oil industry, and about changes in the administration of public lands such as that proposing to lease all public domain by competitive bids. Such a practice, he said, would eventually put the small operator out of business.

W. J. Murray, Jr., of the Texas Railroad Commission, declared himself firmly in support of Gernert in his proration recommendations. He traced the need of proration and its history and benefits in Texas, and advised its consideration by Rocky Mountain producers.

Judge Warwick M. Downing of Denver extemporaneously denied the need for proration in Colorado at this time. There was no opposition voiced to the expressed proposition that proration would be a boon to Wyoming producers.

W. K. Whiteford, president of Gulf Oil Corp., in his keynote address traced the history and benefits of the depletion allowance, and pointed out present dangers to it.

He said that depletion has been a large factor in attracting capital to the oil industry and declared, "Without this amount of capital, new or reinvested, we would not, as a nation, be where we are today and where we hope to be tomorrow."

The Gulf executive concluded, "It is to be hoped that critics of depletion allowance are either misinformed or misguided. Certainly the facts do not bear out their contentions."

Flenniken Heads R.M.O.G.A.

DENVER.—W. W. (Bill) Flenniken, Denver independent operator was named new head of the Rocky Mountain Oil & Gas Association here last week to succeed Hial B. Gernert, Trigood Oil Co., Casper, Wyo.

Vice presidents elected by the association included R. S. Shannon, Jr., Denver; W. M. Saxon, Pure Oil Co., Billings; J. L. (Mike) Dougan, Salt Lake City; and C. L. Larson, Jr., Stanolind Oil & Gas Co., Casper.

H. A. (Dave) True, of True & Brown, Casper, was named treasurer. Mrs. Ruth Palmer, Casper will continue as association secretary, and William (Scotty) Jack, Casper, will continue to serve R.M.O.G.A. as executive vice president.

Several amendments to the constitution and bylaws were proposed and accepted. These increased the executive committee from 20 to 25 members; increased the board of directors from 75 to 100 members; created an operating or "steering" committee to guide the group in policy matters; provided for commencement of officers terms on June 1 after the expiration of the term of the newly elected president.

The latter provision is expected to result in a change in the date of the annual meeting to some time in May of each year.

NATIONAL AFFAIRS

Substitutes Eyed . . .

. . . For super-inch defense pipe-line as oil and gas industries fail to show enthusiasm for U. S. project

WASHINGTON.—Alternative methods for supplying East Coast oil requirements in the event of war will be taken up for study if the oil and gas industries fail to come up with acceptable proposals for the super-inch pipe line sought by the administration.

So far, neither oil nor gas interests have evinced any enthusiasm over the idea of building a 36-in. line from the Gulf Coast, with a leg from the Middle West, to carry oil products or natural gas in peacetime and be converted to the movement of crude should war come.

The purpose of the project is to insure the supply of around 540,000 bbl. daily of crude oil from the gulf and 400,000 bbl. from the Middle West to offset the loss of tankers or free them for transocean service.

So far, four possible ways of achieving this have been outlined. In the order of their feasibility from the current economic standpoint they are:

. . . **A natural-gas line,** providing service to industrial consumers on a fully interruptible basis.

. . . **A refined products line.**

. . . **Stockpiling** of pipe and pumps for construction of a line on the outbreak of war.

. . . **Conversion** of existing natural-gas pipe lines.

The idea of a defense pipe line, proposed by the National Security Council, was based originally on a system which would handle products in peacetime. One of the major objections to the plan was dislocation which would result in the tanker industry. It is realized that something would have to be done to keep our tanker fleet intact—in fact, the NSC has been giving consideration to means for improving it—but just what could be done has not yet been developed.

In view of the impact upon the oil industry, attention was turned to the possibility of a natural-gas line which could be converted. To permit this it would be necessary that the line operate in peacetime upon a wholly interruptible basis which would bar it from serving any defense plants that did not have stand-by equipment for and access to other fuels.

So far, actual consideration has not gone beyond this point. If it proves impracticable to build a pipe line system now, thought will be given to alternative ways of meeting the situation.

The first of these alternatives probably will be the stockpiling of equipment for a line to be constructed if war occurs or appears imminent. This would involve the warehousing of line pipe and pumps at selected points from which they could readily be transported, the mapping out of the right-of-way and the design engineering.

This would be one of the less desirable ways for meeting the situation. In the event of war, manpower would be at a premium. But it is estimated that, with the materials and plans available, the line could be constructed in a matter of 6 months or so.

A less expensive method of providing stand-by facilities would be to stockpile the pumps and other specialized equipment needed to convert existing natural-gas lines to crude oil service. The big question here would be what lines could be converted, since most of the major systems service de-

fense plants whose operations could not be interrupted. Only where other gas lines were close enough to pick up the load or an assured supply of other fuels could be provided would it be possible to take lines out of gas service.

There are a lot of assumptions involved in all four proposals which will have to be exhaustively studied before the government makes even the first move toward setting up a new East Coast supply system. It is not likely that any definite action will be possible for months to come.

Import Cut Opposed

Military defends free flow of hemisphere's production

WASHINGTON. — The administration's stand on proposals to curb oil imports has been clarified by a Defense Department warning that no action should be taken which would interfere with the free flow of Western Hemisphere supplies.

The department's position that there should be no arbitrary curtailment of imports from Canada and Latin America was disclosed by Navy Capt. S. B. D. Wood in a letter to the Senate finance committee.

"Any attempt to restrict such imports into the United States on an established quota basis would likely undermine the vitality of our present Western Hemisphere sources and would deter further development of petroleum reserves in those areas," Wood declared.

Wood indicated that the military is particularly concerned over the effects of a quota or other restrictions on Canadian development.

"Canadian production can be considered as our most important safe source of petroleum for future emergency," Wood continued.

Wood's letter was in line with statements by President Eisenhower that no action should be taken which would impair the oil industry or other vital industries in the Western Hemisphere. Neither the President nor the Defense Department, however, made any specific reference to oil imports from the Middle East. In some quarters it is speculated that if any restrictions on imports are adopted by Congress next year they will be directed particularly at oil from that area.

No solution . . . The Defense Department's letter disagreed with the view expressed by some that imports are too great in volume and are responsible for the present over-supply of the domestic industry. But it did not indicate what

WATCHING WASHINGTON

Bertram F. Linz

War Planning Done

Planning for a possible war is more than just blueprinting military campaigns. It involves also the development of plans for the governmental agencies required to keep the military campaigns going and, these days, for the emergency government to be set up if Washington should suddenly be leveled by an atom bomb.

Should this happen, plans long since perfected would almost automatically go into operation. Calls would be made to certain key men throughout the country. Within a matter of days an alternate Petroleum Administration for Defense, skeletonized but effective, would be set up at a designated—but secret—point.

There are, of course, plans for the control of materials and manpower, and a program for civilian rationing of gasoline, heating oil and, if necessary, other fuels.

All of these plans, and the programs which would be necessary under them, are under constant review, changed as conditions alter, for it is recognized in Washington that while we had 3 years to prepare for World War I and 2 years' notice of World War II, the next war will probably break right over our heads without warning.

Atomic Power Essential

Government plans to build a nuclear power plant at a cost of some $80,000,000 or more are not part of any effort to force a new industry upon the country or any fear of exhaustion of oil or other fuel reserves.

Administration officials foresee the time when nuclear power will be competitive with steam-produced electricity, possibly eventually with hydroelectric power. When that time comes they hope the plants will be built by private industry under government license but there are impelling reasons for starting now on the industrial use of atomic energy.

Our atomic weapons program depends upon the supply of substantial quantities of uranium from foreign nations. Those nations are quite realistic about it. They want to back a winner. If Russia is first to develop practical industrial nuclear power and offers other countries nuclear technology in exchange for uranium coupled with other favorable economic and political agreements we may find much of our uranium supply cut off. That, at any rate, is the thinking in Washington.

"Once it is accepted that our uranium supply may be, to some extent, dependent on early success in the power race, it should be quite clear that the stakes are high," explained Atomic Energy Commissioner Thomas E. Murray.

Putting it even more succinctly, Chairman Sterling Cole of the Congressional Committee on Atomic Energy said "the possibility that Russia might actually demonstrate her allegedly peaceful intentions in the field of atomic energy, while we are still concentrating on atomic weapons, would be a major blow to our position in the world."

McKay Reveals Philosophy

Interior Secretary Douglas McKay doesn't talk like his three immediate predecessors in office.

Over the past 20 years, when difficulties beset the oil, coal or mining industries Harold L. Ickes, J. A. Krug and Oscar Chapman were quick to talk about government action to correct them. But McKay sees government intervention as the first step toward government control.

There is a part to be played by the government in the fuel industries, McKay believes. But it is a supporting role, not that of the principal actor.

The secretary expressed his views recently before a coal producers' meeting.

"If one of the fuel industries becomes weak, the other existing fuel industries are endangered," McKay declared. "A weakened fuel industry sows the first seed for government control and then for government subsidy. Soon the other fuel industries are forced to compete with the government and eventually they too will fall under government control. Such a situation, if it is permitted to occur, will be disastrous.

"The industry must recognize that the remedy cannot be found in legislative expedients which offer temporary benefits but which, when lifted, leave the industry weaker than before."

might be a desirable maximum of imports, nor were any recommendations made as to how the import problem, if one exists, might be solved.

The Senate committee has before it proposed legislation which would limit imports to 10 per cent of domestic demand. Similar recommendations will be laid before the House ways and means committee next year when it considers extension of the Reciprocal Trade Act. The administration this year opposed quotas, as proposed in legislation sponsored by Rep. Richard M. Simpson of Pennsylvania, but has not indicated what position it will take on the matter next year.

Currently at least five groups are engaged in studies of various aspects of our international trade. They include the Randall Commission on Foreign Economic Policy, composed of 10 members of Congress and seven civilians; the Senate banking committee, which has set up an advisory group of some 120 citizens; a Senate subcommittee headed by Sen. George W. Malone of Nevada, which is investigating the adequacy of Western Hemisphere sources of oil and critical minerals and metals; the President's cabinet committee, also studying Western Hemisphere supplies, and Resources for the Future, Inc., which aims at implementing the recommendations made last year by the Paley Materials Policy Commission and which will meet in Washington early next month.

New Goals Approved

ODM and PAD revise 2-year expansion program reducing natural-gas line plans, boosting oil storage capacity

WASHINGTON.—Revised expansion goals for the domestic oil and natural-gas industry have been agreed upon by the Office of Defense Mobilization and the Petroleum Administration for Defense.

The ratified programs are largely as recommended by PAD last July, but with an increase in the desired oil storage capacity and reductions in the objective for natural-gas pipe lines.

The new programs make no provision for any increase in the number of wells drilled above that which the industry itself finds necessary to keep pace with growing demand and to continue to maintain reserve productive capacity.

However, in laying this idea before the ODM in July, Deputy Petroleum Administrator Joseph A. LaFortune promised to make periodic reviews of the productive capacity of the free world. Should the reserve margin reach a point which jeopardizes the mobilization effort or the ability of the United States to meet the initial demands of war, he plans to submit recommendations for the establishment of new goals.

LaFortune emphasized that should a program for drilling prove necessary it would have to be accompanied by new incentives to assure its attainment. Present incentives, such as accelerated tax amortization, are considered inappropriate in this branch of the industry.

The accepted program includes:

... **Refinery construction** to give a net capacity increase of 400,000 bbl. daily in 1954 and 250,000 bbl. daily in 1955 to reach a total capacity of 8,750,000 bbl. a day by January 1, 1956.

... **Natural-gas liquid** processing unit construction for net capacity increases of 120,000 bbl. daily for both 1954 and 1955 with a total capacity of 1,280,000 bbl. daily as the goal for January 1, 1956.

... **Pipe-line construction** of the equivalent of 7,250 miles of pipe in both 1954 and 1955, based on 16-in. diameter ⅜-in. wall pipe weighing 168 tons per mile, requiring 1,000,000 tons of steel each year.

... **Oil-storage capacity** increased from 63,750,000 bbl. to 75,000,000 bbl. per year for both 1954 and 1955 to give a total of about 1,360,000,000 bbl. by January 1, 1956.

... **Natural-gas pipe-line** expansion of 7,690 miles of large pipe (16-in. or more in diameter) and 17,700 miles of smaller pipe for both 1954 and 1955. This represents a decrease from the original figure of 8,650 miles of large pipe.

The refinery program is somewhat more conservative than tentatively set by ODM last September when it suggested an increase of 400,000 bbl. daily in 1954 and again in 1955 to give a total of 8,900,000 bbl. by January 1, 1956. That figure was opposed by PAD as being out of line with its general estimate of mobilization requirements.

The reduced program for large-diameter pipe-line construction more nearly represents the expected availability of heavy pipe than industry expansion plans.

Gas Gain Revealed

Survey shows revenues in 1952 passed $2 billion

WASHINGTON. — Natural gas became a $2,000,000,000 industry in 1952, it was disclosed last week by the Federal Power Commission.

Gas operating revenues of 150 natural-gas companies filing annual reports with the commission totaled $2,227,316,000 last year. Sales of natural gas by the companies amounted to 7,643 billion cubic feet.

Because a high proportion of the operating income of certain companies is derived from other than natural-gas operations, the FPC compiled figures showing the development of the industry on the basis of 127 companies obtaining 50 per cent or more of their operating income from natural-gas operations.

Income . . . These companies had an aggregate gas operating income of $1,965,533,000 last year against $1,669,072,000 in 1951, and total gas sales of 7,098 billion cubic feet against 6,471 billion. The average number of customers for the year was 7,270,000 compared with 6,837,000 in 1951. The rate of increase in income, sales, and customers was about one-third lower than in 1951, the commission noted.

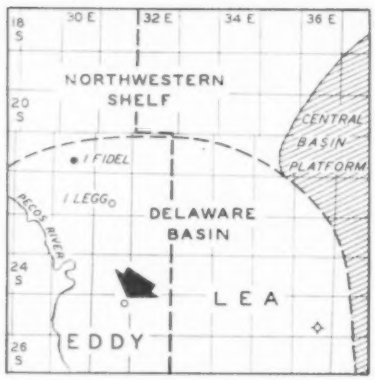
Operating-revenue deductions of the 127 companies amounted to $1,678,693,000 against $1,409,736,000 in 1951, including $234,958,000 paid in federal income and other taxes against $209,798,000. Direct operating expenses were $1,281,555,000 against $1,067,496,000.

The 127 companies had a 1952 net income of $209,871,000 against $203,033,000 the preceding year. Dividend appropriations were $153,886,000 compared with $137,755,000 in 1952.

Foreign Trips Planned

WASHINGTON.—Chairman Charles A. Wolverton and several members of the House of Representatives commerce committee plan to spend a week in the Middle East surveying the present oil situation after completing their present study of public health matters in Europe.

Another trip by the committee is planned early next month to Venezuela for a look at that country's petroleum operations and talks with government officials. Periodic trips to foreign oil producing areas are taken by the representatives of the committee to inform them on current developments and to aid them in handling oil legislation.



Wildcat Sets Record

Delaware basin test well is drilled to 16,705 ft.

FORT WORTH.—Richardson & Bass set a new drilling depth record for southeast New Mexico and West Texas when 1 Harrison-Federal in Section 12-25s-30e stopped drilling at 16,705 ft.

Location of the well is 28 miles southeast of Carlsbad in the southeast corner of Eddy County. Geologically, it is situated in the approximate center of the Delaware basin.

Testing of the well is under way and will require considerable study before any analysis can be made. While drilling, a test was run in lime and shale between 12,215-12,365 ft. Gas and distillate sprayed within 1 hour. In the next hour the well yielded 8.28 bbl. of 55° distillate. When plugged back to 12,343 ft. for further tests, the well flowed gas at the daily rate of 1,527,000 cu. ft., and yielded 4 bbl. of distillate in 1 hour. The latter test was through 3/8-in. choke.

The well very likely was not out of the Wolfcamp of lower Permian age at its total depth of 16,705 ft. However, its shows of oil below the Delaware Mountain group is the first of any consequence so far found, except for the Glenna gas pool in Pecos County, Texas. This should be of considerable encouragement to future operators in the basin.

The new depth exceeds by 246 ft. Richardson & Bass 1 Cobb-Federal, 25 miles to the north. This well was one of the first of the company's series of deep explorations in the Delaware basin this year, and is considered just within the northern rim of the basin. No. 1 Cobb-Federal was able to penetrate the deep sediment beds which overlie most of the basin, and went into pre-Cambrian granite at 16,396 ft. It later plugged back and made a discovery well in the Delaware Mountain group around 7,000 ft.

Other companies reported planning Delaware basin tests include Continental Oil Co., with a location to the east of the Harrison-Federal project, and Stanolind Oil & Gas Co., which has location northwest of Harrison-Federal.

San Juan, Deep Valley Merge

San Juan Exploration Co., Dallas, last week absorbed by merger, Deep Valley Petroleum Co., Inc., and Bradley Oil Co., in an expansion move which will considerably increase the total capitalization and scope of operations of the San Juan group of companies.

San Juan's operations include the management of some 400 oil and gas wells in the Mid-Continent area, the operation of the consulting firm, Bradley, Oliver and Associates, and either directly or through wholly owned subsidiaries, the outright ownership of approximately 150 oil wells in Texas, Oklahoma, Kansas, Mississippi and Canada.

It includes an active exploration organization which has drilled 10 wildcats during the past year. The company's owned production is in excess of 1,200 net bbl. per day and it manages production of approximately 2,000 net bbl. per day.

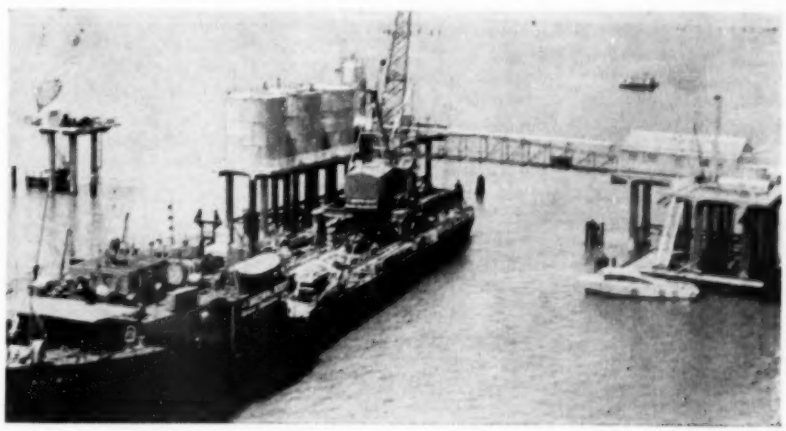
The Deep Valley Petroleum Co. was organized in Toronto about 8 months ago for the purpose of acquiring producing oil and gas properties. At the time the firm was absorbed by San Juan it had accumulated three gas producing wells in Palo Pinto County, Texas, and 11 oil producers in Crockett County, Texas, with a net daily production of about 200 bbl. daily. These properties had been purchased from Harris-Eastham, of Midland.

Bradley Oil Co., a Dallas concern, owned one-quarter of the properties held by Deep Valley Petroleum.

Texas U. Plans Land Auction

AUSTIN.—An auction of oil and gas leases on 50,277 acres of West Texas land will be conducted by the University of Texas here December 11.

The tracts are in Andrews, Crockett, Crane, Reagan, Irion, Upton, Pecos,



New Offshore Platform in Operation

NEW ORLEANS.—One of the largest and most modern production platforms constructed for offshore work since the tidelands controversy was settled has been put into operation by Shell Oil Co. at Main Pass Block 35 field, off the coast of Louisiana.

The new facilities replace those installed on two sunken LSMs which had been in use for several years. The platform is located at what is more commonly known as "Battledore Reef," and contains modern quarters for the crew, a generator building, fresh-water tank, a boiler for heating steam for the heater-treater, and a special boat landing. Brown & Root Construction Co. installed the facilities.

Level of the platform is 29 ft. above the water, to assure safe operation during high seas. Water at this point is about 9 ft. deep. The platform is supported by pre-stressed concrete pilings, 84 ft. long, driven inside galvanized steel pipe resting on matting.

Permanent flow lines from well heads in the field were laid to the production platform.

Ward, and Winkler counties. The sale will also include eight drilling blocks, majority of which are 2,500 acres in size. Stipulations on these blocks call for minimum cash bonuses and an agreement to start drilling to a specified depth within 6 months.

Producing Interests Sold

DALLAS.—Oil and Gas Property Management, Inc., Dallas, has closed a deal with A. W. Cherry, also of Dallas, for the purchase of producing oil interests in Illinois, Indiana and Montana for a cash consideration of $350,000.

The Management firm obtained from Cherry working interests ranging from 11 to 43 per cent in 75 wells located on 20 leases in the various states. Net production obtained by the firm is approximately 175 bbl. of oil per day, according to John A. Crichton, president.

The wells involved are located in Caborn field, Posey County, and Gibson County, Indiana; Garfield County, Montana; and in Richland, White, Wabash and Edwards counties, Illinois. The Caborn field is a waterflood project.

Unitization Approval Asked

AUSTIN.—Lone Star Producing Co. has asked the Texas Railroad Commission for approval of a unitization agreement, gas cycling and pressure-maintenance program for the Pleasanton field of Atascosa County.

Lone Star owns 100 per cent of the working interest in the field and 89 per cent of the royalty and overriding interest holders have approved the agreement which calls for participation on the basis of surface acreage. Sabine Royalty Corp. favors unitization of the field, but opposes the participation formula.

The producing company estimated the proposed program would increase oil recovery by almost 10 per cent and condensate recovery by 67 per cent.

The field now has four oil wells and one gas well, and Lone Star plans to drill two additional wells.

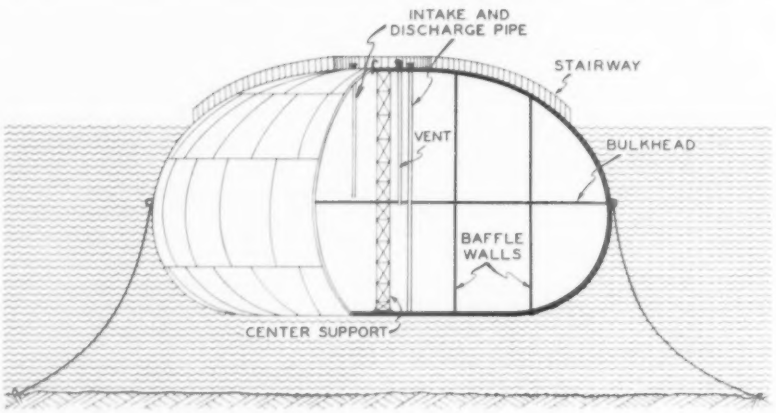
LaSalle Water Flood Asked

AUSTIN.—Quintana Petroleum Corp. seeks Texas Railroad Commission permission to water flood the 5,500-ft. lower Wilcox reservoir beneath a 610-acre lease in the Washburn Ranch field of La Salle County.

J. J. Crowder, engineer for the applicant, told the commission he estimates recovery of an additional 2,000,000 bbl. of oil from the program. The 16 wells on the lease have produced 2,334,000 bbl. of an estimated 6,800,000 bbl. of oil originally in place.

Crowder said the plan is to use fresh water from the Carrizo-Wilcox at 3,900 ft. for injection through two of the existing wells.

GULF COAST



New Storage Floats

Partially submerged spheriod tank designed for offshore production's answer to piling costs, danger from storms

HOUSTON.—A floating storage tank may hold a practical answer to the problem of what can be done with daily crude oil and liquid hydrocarbon production in offshore locations in the Gulf of Mexico.

The tank, fashioned like the conventional Horton spheroid tank, would always be partially submerged. Its curved surface would offer only a fraction of the resistance to wave and wind action found in other type tanks. The tank would be moored a convenient distance from a producing platform and receive the daily production, which would in turn be picked up later by tenders.

According to I. W. Alcorn, chief division production engineer of Pure Oil Co.'s Gulf Coast division, the tank's inventor, it would have several advantages over storage barges and conventional tanks on pilings. He included the following:

... **No piling structure** would be needed. Costs of pilings in deepwater offshore locations can be excessive.

... **Less vulnerability** to fire hazards. The floating tanks could be floated away from a producing platform in case of blowout or fire.

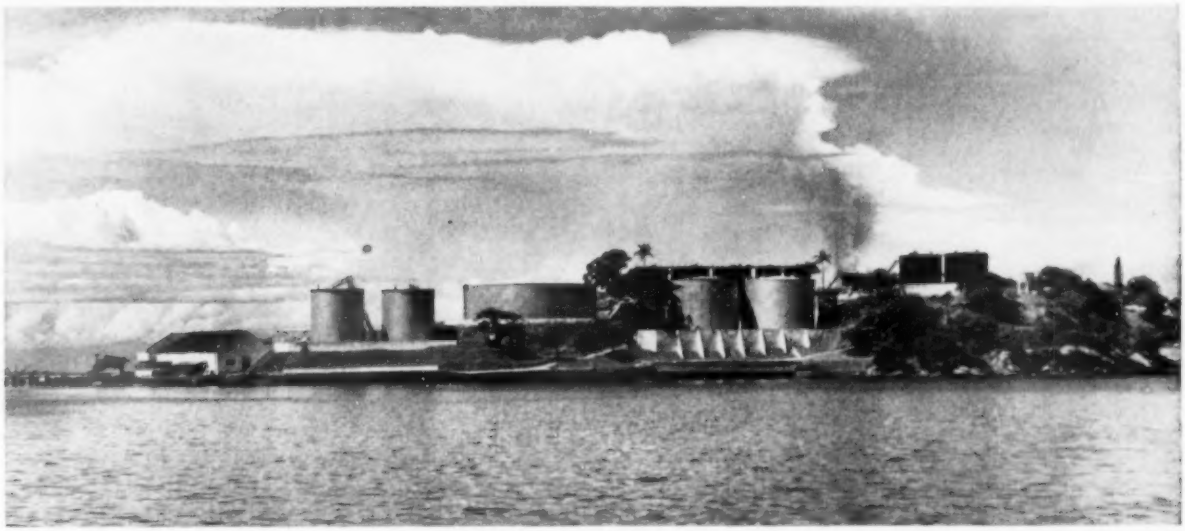
... **Spheriodal surface** offers less resistance to high winds and since it is partially submerged, it offers less resistance to wave action. Storage barges must be kept headed into the wind in storms to avoid capsizing.

Tank design . . . The tank would be made of steel and designed to withstand the wave forces which could be expected in its practical uses. An additional feature would be its division longitudinally into two individual tanks. This would provide increased stability whenever the tank is emptied of accumulated production. The lower half could be filled with sea water ballast when the tank is empty, providing adequate draft to offset the buoyancy of an empty tank. In refilling the tank, the upper section would receive production first. Once it is filled, the sea water would be evacuated from the lower portion and it then could receive additional production.

Provision is made for venting both halves of the tank and both halves will be equipped with intake and discharge lines. A support will extend vertically in the center of the tank to afford necessary strength, and vertical bulkheads will be provided in each half of the tank to prevent sloshing of liquids. A stairway would run across the upper portion of the tank's surface for use of operating personnel.

Mooring lines from lugs on the tank would extend to piling imbedded in the bottom of the Gulf, with adequate slack to accommodate movement of the tank.

Pure Oil Co. has been assigned patent No. 2,655,888 on Alcorn's development.



MARKETING FACILITIES like the terminal shown above at Rio de Janeiro will feel little effect from the new Brazilian oil law. Marketing and importing is the only activity open to anyone except Brazilian citizens.

Brazil Turns Key in Closed Door

New Brazilian oil law doesn't change a thing concerning foreign investors, but it will raise stiff public taxes

Dahl Duff

AS far as foreign oil capital is concerned, Brazil's new petroleum law has the effect of sealing and locking a door that was already closed.

Because the needs of the fast-expanding Brazilian market must be met, the law makes no effort to curtail the importing and distributing activities of the foreign marketing companies. There was never any grounds for believing Brazil would allow foreign participation in exploration, production, or refining.

Since the existing position of the foreign companies is largely unchanged, the significance of the Petrobras bill lies in the fact that it represents a major recasting and expansion of the government effort to develop a substantial oil industry under state direction. The principal immediate effect is on the Brazilian public which must pay the stiff taxes provided to finance the venture.

The funds provided for Petrobras run into the billions of cruzeiros. The initial capital amounts to four billion cruzeiros (equivalent to about $83,000,000 on the current free market rate of about 48 cruzeiros to the dollar), and the bill calls for increases to 12 billion cruzeiros ($250,000,000) by 1957. This is a large sum by any standards, but dollars or sterling, and not cruzeiros, are required to buy drilling rigs, exploration equipment, refinery units, and the many other expensive items necessary to a large-scale oil industry.

Trade balance . . . Brazil had a favorable trade balance with the U. S. during the first quarter of 1953, but there have been recurring exchange crises, and imports of all commodities have been restricted to bare essentials. Brazil's foreign exchange problem was reflected in a British - Brazilian agreement announced only a few days before the final passage of the Petrobras bill. Under its terms the Brazilian Government agreed to restrict sterling payments for petroleum products from British companies (principally Shell) to £15,000,000 annually until the backlog of Brazilian commercial debts are cleared up.

Considerations of the oil question in Brazil has been charged with emotion, national pride, and questions of patriotism. Ultra-nationalist groups campaigned under the slogan, "o petroleo e nosso," or "the oil is ours." A minority, who felt that Brazil lacks resources to find and develop whatever oil the country may have, was submerged by the uncompromising advocates of exclusive state operation and ownership.

Two decree laws of 1938 prohibited exploration, development, and refining by foreign companies, but the 1946 constitution provided for petroleum exploitation by native Brazilians and national corporations without definitely saying the latter must be composed exclusively of Brazilians. As the leading marketer in Brazil, Standard Oil Co. (N. J.) affiliate, Standard of Brazil, publicly stated several years ago it was ready to participate in oil development provided such activities were given a satisfactory legal basis.

Restrictions . . . The law establishing Petrobras, or Petroleo Brasileiro, S.A., leaves no opening for foreign participation. When the bill was first introduced by the administration of President Getulio Vargas, nationalist elements attacked it on grounds it was not restrictive enough in this respect. Last April the Senate voted 30-21 for a provision which would have allowed Petrobras to contract with foreign companies on limited 5-year exploration programs. This was later rejected in the chamber, and the final terms of the bill represent a victory for the forces championing completely national operations.

The Petrobras bill makes the Conselho Nacional do Petroleo an advisory and supervising agency for the government. Petrobras will be managed by an administrative council and an executive board. The council president will

be nominated by the president of the republic and will have veto power over decisions of the council and the executive board. The executive board will consist of a president and three directors nominated by the president of the republic.

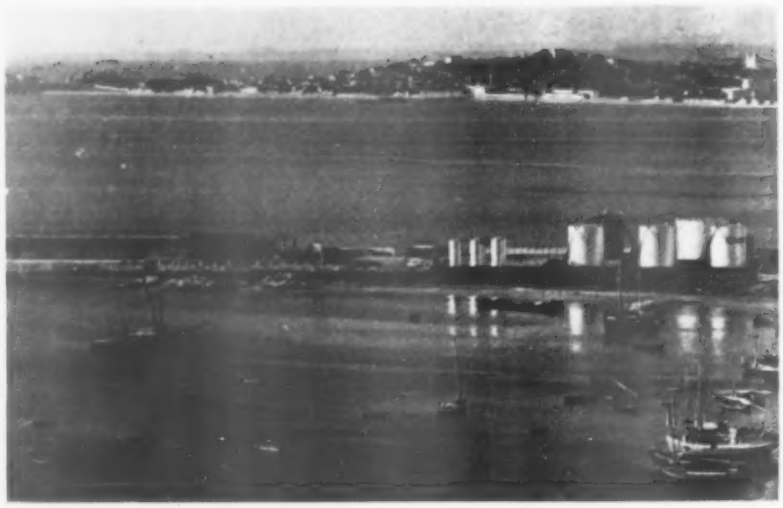
The opening article of the bill declares a federal monopoly on petroleum exploration and development, refining of either domestic or imported crude, marine transportation of Brazilian-produced crude and products, and pipe-line transportation of oil and gas regardless of their origin.

Refineries now in operation in the country are excluded from the law. This exemption affects a 6,000-bbl. daily privately owned refinery in Rio Grande do Sul and two smaller topping plants. The law also leaves valid authorizations to construct refineries issued prior to June 30, 1952, provided the plants are in operation by the times specified in the refinery concession. There are now three refineries under construction in Brazil by private Brazilian interests, one of 20,000 bbl. daily at Sao Paulo, one of 10,000 bbl. daily at Rio de Janeiro, and one of 2,500 bbl. daily at Manaus.

However, the future of these private refineries is made somewhat uncertain by a provision in the new law allowing Petrobras, without special legislative permission, to buy into the companies for the purpose of converting them into subsidiaries in which it must hold a minimum of 51 per cent. Furthermore, the law forbids any authorization permitting these privately owned refineries to expand capacity.

Framers of the Petrobras bill sought by various means to facilitate operations of the government oil corporation and insure its success. Petrobras can expropriate property in accordance with existing laws. Its acts and property are exempt from federal taxes and other taxing units in the republic are asked to provide similar privileges. Whatever Petrobras imports is free of duties and is cleared through customhouses by decree of the inspectors, although the company is subject to restrictions regarding importing goods which can be obtained within the country.

The entire initial four-billion-cruzeiro capital of Petrobras will be provided by the federal government and in subsequent capital increases it must underwrite sufficient common stock to be assured of at least 51 per cent of the voting stock. The government's initial contribution will consist of oil rights and assets, and if this is not enough, the national treasury is authorized to advance, against taxes and contributions provided for the corporation, a sum not exceeding 1½ billion cruzeiros ($31,000,000).



TERMINAL of The Texas Co. at Bahia will operate undisturbed in its picturesque setting.

Stockholders . . . The law Petrobras may admit as stockholders only (1) public national bodies, (2) the Bank of Brazil and mixed-economy companies created by federal, state, or local law and which are under permanent control of public authorities, (3) native-born Brazilians, or those naturalized for more than 5 years and living in Brazil, either single, married to Brazilians or married to foreigners not in a community-property status, (4) private companies organized under a 1939 decree, and (5) other private Brazilian companies, in which only persons as defined in item 3 are stockholders.

The text of the law spells out the methods by which Petrobras is to be financed. Proceeds from import duties and excise taxes and exchange remittances applicable to motor vehicles will be used by the federal Government to buy Petrobras shares and debentures. Additional funds will come from the taxes on petroleum products which were enacted in November 1952. This law levied a varying schedule of taxes running up to, in the case of imported gasoline, 1,722 cruzeiros per metric ton, equivalent to about 10 cents a gallon. It was provided that 75 per cent of the revenue would go toward highway construction and 25 per cent for oil activities. Total collections this year were expected to amount to 3,966,000,000 cruzeiros, or about $82,500,000.

The Petrobras bill also set up a graduated set of taxes for owners of automobiles, boats, and aircraft. If the taxpayer otherwise qualifies as a shareholder in Petrobras, payment of the tax gives him a certificate which may be changed eventually for preferential shares or debentures in the government oil corporation. The schedule set a tax of 1,000 cruzeiros ($21) for vehicles weighing up to 2,200 lb. The tax rises to 8,000 cruzeiros ($168) for private cars weighing more than 1,800 kilos, or 4,000 lb. These taxes will undoubtedly promote a trend toward lighter, low-horsepower vehicles. At the present time, a low-priced new American car imported into Brazil costs the equivalent of about $5,000.

Rio de Oro Well Completed

Colon Development Co., Ltd.'s exploratory well, Orden 5, at Rio de Oro in western Venezuelan has been completed as a field discovery.

The well, 37 miles northwest of the company's West Tarra field and adjacent to the Colombian boundary, produced an average of 360 bbl. daily of oil accompanied by 10 per cent water during an initial 2-day test under steady conditions. In subsequent short tests with a smaller bean, production was at rates between 150 and 170 bbl. daily with from 1½ to 4½ per cent water.

The well was drilled to a depth of 7,521 ft. Gravity of the crude is about 44°. Production has been previously found at about the same depth across the Colombian boundary by Colombian Petroleum Co.

Bolivian Search Organized

HOUSTON. — Glenn McCarthy, Houston oil man who heads Glenn McCarthy, Inc., will lead a staff of 16 men to Bolivia to begin seismic work and drilling on a 970,000-acre concession as soon as equipment now being tested here is shipped to Latin America.

The staff will include John White, general superintendent, and George W. Underwood, former regional geologist in Venezuela for Mene Grande Oil Co., who was recently appointed coordi-

nator of the McCarthy party's drilling and seismic activities.

Jorge Lavadenz, LaPaz business man and former government official, said on a recent visit to Houston that both the Bolivian government and people are looking forward to McCarthy's arrival. He said the project is regarded as "the beginning of a promised program to develop the nation's natural resources."

EUROPE

Petrochem Venture Started

What is expected to be one of the largest petrochemical undertakings in Europe has been started with the formation in West Germany of a new company by Badische Anilin und Soda Fabrik, A. G., and Deutsche Shell, A. G.

The joint operating subsidiary is scheduled to begin work in the near future on a large plant for production of polythene and ethyl benzene at Wesseling near Cologne in North Rhine-Westphalia.

The plant will operate on gases from the Wesseling refinery of Union Rheinische Braunkohlen Kraftstoff, A. G. This is a 28,000-bbl. daily plant with 12,400 bbl. daily thermal cracking and reforming, and 6,000 bbl. daily hydrogenation capacity.

First production from the new petrochemical facilities is planned in 1955. The polythene will be sold under Bayer's trade name, Lupolin, and the ethyl benzene is expected to be used largely in the manufacture of polystyrene.

Heavy Oil Found in Sicily

Heavy oil has been tested in Gulf Oil Corp. Ragusa 1 wildcat in southeastern Sicily.

The 12°-16°-gravity crude was obtained from formations believed to be the Jurassic at around 6,000 ft. The well is the first undertaken by Gulf on an acreage of its wholly owned subsidiary, American International Fuel & Petroleum Co. The well is being carried deeper and at last reports was drilling below 6,500 ft.

French Refinery Has New Unit

Esso Standard, S.A.F., has placed in operation a new fluid catalytic cracking unit at its Port Jerome refinery in northern France. The unit has a capacity to process 10,500 bbl. daily of heavy gas oil.

A third distillation unit will be erected at Port Jerome to step up the crude-oil throughput, and production of lubricating oils also will be expanded. The construction program is to be completed during the first half of 1954 when the refinery will handle an average of about 58,000 bbl. daily.

Hoover Hears Iranian Story in Oil Controversy

A leading role in the current American efforts to bring about a settlement of the long-standing Iranian nationalization dispute has been taken by Herbert Hoover, Jr., recently named special adviser to U. S. Secretary of State Dulles. In this group at the Iranian Foreign Ministry in Teheran are, left to right: Iranian Premier Fazlollah Zahedi; Hoover; Abdullah Entezam, Iranian foreign minister; and Loy W. Henderson, United States ambassador to Iran. Hoover recently spent 2 weeks in Iran conferring with top Iranian officials in what was regarded as an effort to find a basis for resumption of full-fledged negotiations. Last week he was in London presenting the general Iranian views to the British. (Associated Press Newsphoto.)

FAR EAST

Japanese Development Urged

A proposal under which the Japanese Government would finance an intensive exploration and development program in the country has been made by the Japanese Petroleum Resources Development Council.

Under the plan submitted to the Ministry of International Trade and Industry in Tokyo, the equivalent of $28,000,000 would be spent over a 5-year period in an effort to increase Japanese oil production.

The country's production averages about 6,000 bbl. daily from numerous small fields in northwest Honshu.

The goal would be to raise Japanese production to a total of 17,300 bbl. daily. Existing fields would increase their output to about 7,300 bbl. daily, and secondary recovery would add another 2,000 bbl. daily. The program envisages the production of some 8,000 bbl. daily from new fields to be discovered.

Of the total $28,000,000, the government would put up $15,400,000, and the Japan Development Bank, another $5,050,000. The remainder would be raised by Teikoku Petroleum Co. and other interested business organizations.

AFRICA

Fifth Madagascar Well Dry

The French company, Soc. des Petroles de Madagascar, has completed the fifth unsuccessful well in its 2-year drilling program in the south basin of Magadascar.

The semi-public, government-supported company is expected to study results of the program thus far before carrying out further drilling. The wells were drilled in the east part of the basin, the last three of them to relatively shallow depths between 2,300 and 3,000 ft. The first two were deep tests.

Th exploration in Magadascar is a part of the intensive effort being made under French Government auspices to find oil in metropolitan France or the overseas territories.

South African Line Proposed

Construction of a products pipe line from Durban to near Johannesburg in the Union of South Africa is under consideration.

The South African Road Federation recently named a group to advise the government on the economics of a line to supply the Witwatersrand. Initial estimates place at about $25,000,000 the cost of a line from Durban to Germiston with a branch to the gold fields in the Orange Free State.

High railroad freight rates on petroleum are considered as justifying the project.

PERSONALS

Pure's Top Refiner

New manager of refining started as clerk in 1934

WHEN Pure Oil Co. set up the new post of general manager of refinery operations July 1, a young refinery veteran, P. N. (Nick) Gammelgard, took another of his regular steps up and into the job.

It was just 19 years before this recent promotion that Gammelgard, a native of Chicago, left Northwestern with a bachelor of science degree and headed for Pure Oil's Toledo refinery. He started as a clerk in the mechanical department at a time when jobs were not too plentiful. During the next 5½ years, he became maintenance engineer and then chief inspector of the refinery's inspection department.

A reserve officer since his graduation from Northwestern, Gammelgard was given a leave of absence to enter active Navy service in 1940. He went aboard the destroyer Humphreys and took part in the amphibious landings in the Aleutians early in the Pacific war. He was in the Solomon Islands and New Guinea campaigns and later saw service in the Atlantic and Mediterranean. Gammelgard took part in 12 landings in the Philippines.

He left naval service in October 1945 as a commander and with a citation from the Secretary of the Navy in his pocket, went immediately into the refinery-control division of Pure Oil's Chicago headquarters.

He was named operations manager of the refinery operating department in 1949 and was in that job when appointed to the new position.

A hard-working tennis player before the war, Gammelgard now puts most of his home energy into a large lawn and rose garden at his Mount Prospect home in suburban Chicago, which he shares with Mrs. Gammelgard, Sarah Jane, 13, Peter 10, and Doris Jean 5.

Charles F. Scott, treasurer for the past 3 years of Standard-Vacuum Petroleum, Mij., Indonesian producing and refining subsidiary of Standard-Vacuum Oil Co., has been named assistant treasurer of the parent company in New York. He joined Standard-Vacuum in 1939.

Grady E. Johnson has been made vice president and general manager of Black Petrol Operators, Ltd., at Lloydminster, Alta. He formerly was chief petroleum engineer for Petrol-Structors, Ltd., at Calgary, Alta.

W. E. Dunlap, formerly vice president and production engineer with Macoil Corp. at Paramount, Calif., has joined Ojai Oil Co. at Los Angeles as vice president and production engineer.

Paul C. Brooke, Fort Worth, has been elected vice president of Sinclair Oil & Gas Co. and placed in charge of exploration in Texas and southeastern New Mexico. He replaces **Don R. Gearhart,** who was recently transferred to Tulsa as director of the firm's exploration activities.

R. M. Heskett, president of Montana-Dakota Utilities Co., Minneapolis, Minn., and **John E. Heyke, Jr.,** president of Brooklyn Union Gas Co., were named to the board of trustees of the Institute of Gas Technology at Illinois Institute of Technology during the Gas Institute's twelfth annual meeting October 27.

G. A. Olsen, president of Sunland Refining Co., Fresno, Calif., was named president of the National Lubricating Grease Institute at its twenty-first annual meeting in Chicago, October 26-28. He succeeds **W. W. Albright,** Standard Oil Co. (Ind.), Chicago. **H. L. Hemmingway,** Pure Oil Co., Chicago, was elected vice president. **A. J. Daniel,** president of Battenfeld Grease & Oil Corp., Kansas City, and **H. F. Bennetts,** Kansas City, were renamed treasurer and executive secretary, respectively. **Claude L. Johnson,** president of Jesco Lubricants Co., North Kansas City, and **R. W. Goodale,** manager of lubricants division of Standard Oil Co. of California, were elected directors of the association.

James E. Armstrong, manager of operations for Drilling & Production Co., Bakersfield, Calif., and **A. C. Thane,** San Francisco, have been elected to the board of directors of Occident Petroleum Corp., Los Angeles.

Dean D. Durall, engineer trainee with Gulf Oil Corp., has been transferred from Bully Camp, La., to Kilgore, Tex.

Paul Quillian, petroleum engineer with Sohio Petroleum Co., has been transferred to Okmulgee, Okla., from Owensboro, Ky.

Albert B. Crowther, Jr., formerly junior exploitation engineer trainee with Shell Oil Co. at New Orleans, is doing graduate work in petroleum engineering at the University of Texas, Austin.

Dr. William Embry Wrather, director of the U. S. Geological Survey, has been awarded the thirtieth John Fritz Medal. The award, one of the highest honors of the engineering profession, was presented jointly by the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. Prior to being appointed to his present position, he was associated with J. M. Guffey Petroleum Co. and was a consulting geologist.

Reid Payne, petroleum engineer with Sohio Petroleum Co., has been transferred from Centralia, Ill., to Owensboro, Ky.

Adrian E. Mix, formerly with Ashland Oil & Refining Co. in Shreveport, and Billings, Mont., has become a consulting geologist in the Arkansas-Louisiana-Texas area with headquarters in Shreveport.

C. D. Miller has been appointed vice president and general manager of Harper & Turner Oil Co., Dallas. He recently resigned as executive vice president of British-American Oil Producing Co., wholly owned subsidiary of British American Oil Co., Ltd. Miller first was associated with Barnsdall Oil Co. and later joined British-American as vice president in charge of production.

PERSONALS

S. G. Miller, who recently resigned as principal gas engineer for the Long Beach Harbor Department, has joined Empresa Colombiana de Petroleos as an engineer in DeMares oil field at El Centro, Colombia.

W. L. Haynes, civil engineer with Humble Oil & Refining Co., has been transferred from Dickinson to Baytown, Tex.

N. C. Simpson, manager of production; **T. P. Fulton,** divisional controller; **J. T. Goodman,** manager of land; and **G. B. Lamb,** manager of exploration, have been appointed to an executive operating committee of the Houston division of Gulf Oil Corp. and Gulf Refining Co.

Lovett C. Peters of St. Louis has been elected financial vice president of Continental Oil Co. with headquarters in Houston. He had been financial vice president of Laclede Gas Co.

Chester P. Sappington has been elected chairman of the board of General Geophysical Co., Houston. He formerly was a vice president and has been with the firm since 1939. **T. O. Hall** has been named president, succeeding the late Earle W. Johnson, founder of the company. **Kenneth R. Wells,** with the firm since 1936, has been elected vice president.

Eighteen men connected with the oil industry were among the 241 alumni to whom citations for distinguished achievement was presented October 23 as part of the one hundredth anniversary of the University of Michigan's College of Engineering. They are: **Harry Weidel Ferguson,** vice president, Humble Oil & Refining Co., Houston; **Dysart Edgar Holcomb,** dean of the College of Engineering, Texas Technological College, Lubbock, Tex.; **Emil Emanuel Ebner,** vice president, Quaker State Oil Refining Corp., Emlenton, Pa.; **Chalmer Gatlin Kirkbride,** president, Houdry Process Corp., Marcus Hook, Pa.; **Karl Henry Hackmuth,** research planning board, Phillips Petroleum Co., Bartlesville, Okla.; **Theodore William Legatski,** assistant director of research, Phillips Petroleum Co.; **Charles Adelbert Breitung,** consulting petroleum engineer, Tulsa; **John Guild Staudt,** vice president and general manager, Dowell Incorporated, Tulsa; **Homer Zettler Martin,** assistant director of development division, Standard Oil Development Co., Elizabeth, N. J.; **Alfred William Fleer,** manager of manufacturing development, Shell Chemical Corp., New York; **Herschel C. Smith,** manager, asphalt division, Pan American Petroleum & Transport Co., New York; **Wilburn Carroll Schroeder,** director of U. S. Bureau of Mines' synthetic-fuels program, Washington; **Elmore Shaw Pettyjohn,** director, Institute of Gas Technology, Chicago; **Walter Joseph Podbielniak,** president and technical director of Podbielniak, Inc., Chicago; **Marshall Burton Standing,** supervisor of drilling and production research, California Research Corp., La Habra, Calif.; **Lee Van Horn,** vice president, Fluor Corp., Ltd., Los Angeles; **Otto Neil Miller,** general manager of manufacturing, Standard Oil Co. of California, San Francisco; and **Mott Souders, Jr.,** associate director of research and development, Shell Development Co., San Francisco.

Houston NOMADS Entertain Foreign Visitors

International guests at the October meeting of the Houston chapter of NOMADS were four oil men operating overseas. Left to right, they are Hank Besijn, Shell Oil Co. of Venezuela, Maracaibo; Fred Haesecker, Asiatic Petroleum Corp.; Guy Woodruff, Mene Grande Oil Co., Barcelona, Venezuela; and N. C. Bouco, Y.P.F. of Argentina, Buenos Aires.

Aaron A. Spence has been appointed district chief dispatcher for United Gas Pipe Line Co. at Dallas. He formerly was assistant district chief dispatcher at Carthage, Tex.

A. H. Carpenter, engineer formerly with Phillips Petroleum Co. at Big Spring, Tex., has joined El Paso Natural Gas Co. at El Paso, Tex.

Jack Anderson has been promoted from assistant general foreman in the process division to general foreman at the Sugar Creek, Mo., refinery of Standard Oil Co. (Ind.). He is in charge of all process units in the west plant of the refinery. Anderson also has been project engineer and was associated with Cities Service Oil Co. and Midland Cooperative Wholesale at Duncan, Okla., before joining Standard.

W. L. Moody, III, of San Antonio, recently became president of Tex-Penn Oil & Gas Corp., a subsidiary of Pennsylvania Coal & Coke Corp. Moody, through Moody-Texas Oil Corp., has acquired jointly with Pennsylvania Coal & Coke 92 producing oil and gas wells in over 12,000 acres in Texas. He also has been elected to the Pennsylvania firm's board of directors and was one of the organizers of United Gas Corp., Republic Natural Gas Co., and General Crude Oil Co.

Richard A. Pohly has resigned as a vice president of Seismograph Service Corp., Tulsa, to direct activities of the newly formed Pohly Exploration Co., a gravity-meter contracting company also headquartered in Tulsa.

Clarence L. Moody, formerly staff research geologist for Ohio Oil Co. at Shreveport, has retired. He joined the firm at Casper, Wyo., in 1918 and was advanced to division geologist at Shreveport in 1921. In 1950 he was promoted to the chief geologist's staff. Moody was president of the American Association of Petroleum Geologists in 1950.

Robert C. Hadden has been promoted to the recently created position of assistant manager of the crude-oil and products department of Tide Water Associated Oil Co.'s western division at San Francisco. He has been operat-

PERSONALS

ing assistant of the department and will assist in directing the purchase and exchange of crude-oil and products and coordination of the supply of petroleum raw materials into the company's refineries at Avon and Watson, Calif.

Sir William Fraser, C.B.E., chairman of Anglo-Iranian Oil Co., Ltd., was recently made an officer of the Legion of Honor by French Government. The award for his service to the French national economy. It marks the government's appreciation of his help and that of Anglo-Iranian in the construction of the Dunkirk refinery and in the overseas marketing of the products of the company's associate, Societe Generale des Huiles de Petrole BP, an important French source of foreign exchange.

Pan Am Officials Attend Dedication of New Cracker

Officials of Pan American Refining Corp. present at the dedication last week of a new 30,000-bbl. fluid catalytic cracking unit at the firm's Texas City, Tex., refinery were, left to right: James P. Patterson, vice president of the parent company, Pan American Petroleum & Transport Co., Inc., New York; Dr. Harold R. Snow, vice president and general manager of manufacturing for Pan American Refining; B. F. Babin, general superintendent of Texas City plant; and John B. Richardson, refinery public-relations director, who served as master of ceremonies.

A. D. Cumming has been appointed by the Public Service Commission of Saskatchewan as research petroleum geologist with the petroleum and natural-gas branch of the Department of Mineral Resources. He will carry out research at the geological-survey laboratory in Regina. Cumming had been engaged for 2 years in research in the sediments of northeastern Scotland.

DEATHS

Harry J. Crawford, 86, chairman of the board of Quaker State Oil Refining Corp. and one of the principal developers of the natural-gas industry, died November 3 in an Oil City, Pa., hospital following a short illness. Crawford, named "Pioneer of Pioneers" of the petroleum industry at the International Petroleum Exposition in Tulsa last May, was one of the founders of the companies making up the present Columbia Gas & Electric system, helped finance Oklahoma Natural Gas Co., and was a director and major stockholder in Lone Star Gas Co. He entered the oil industry in 1888 as a foreman for South Penn Oil Co., and had been in it ever since. He was chairman of several other oil companies, president of the Oil City National Bank and the First National Bank of Emlenton, Pa., his home town, and a director of several others.

Leon Mehler, 43, secretary-treasurer of Anschultz Drilling Co., died recently in Wichita, Kans.

Alva O. Gilkison, 59, independent operator, died recently in Washington, Ind., following a long illness.

Chester C. Clark, 67, died recently in Shreveport, La. He had been district geologist for Shell Oil Co. and Union Producing Co. and was closely associated with the development of many major oil and gas fields in the Ark-La-Tex area. For the past 2½ years he had been a consulting geologist.

A. L. (Link) Cockran, 52, independent operator, died recently in a Henderson, Ind., hospital. His home was in Evansville, Ind. Cockran was active in developing the Smith Mills pool in Henderson County, Kentucky.

R. H. (Bob) Henderson, 72, pioneer Texas oil man, died November 1 in Midland, Tex. He was one of the discoverers of Breckenridge field in 1918, and also was prominent in oil development at Laredo and in East Texas. He had been active in the Permian Basin since 1934.

Albert E. Landsittel, 64, retired sales manager of Globe Oil & Refining Co., died recently at Kankakee, Ill.

John W. Stark, 70-year-old independent producer, died recently in Wichita, Kans. He was credited with having discovered the Lorraine pool of Ellsworth County, Kansas, and had been an independent operator in Texas before moving to Kansas about 20 years ago. Stark was a charter member of the Kansas Independent Oil & Gas Association.

Charles W. Ellison, 57, consulting geologist, died November 3 in Stillwater, Okla., after being struck by a falling garage door.

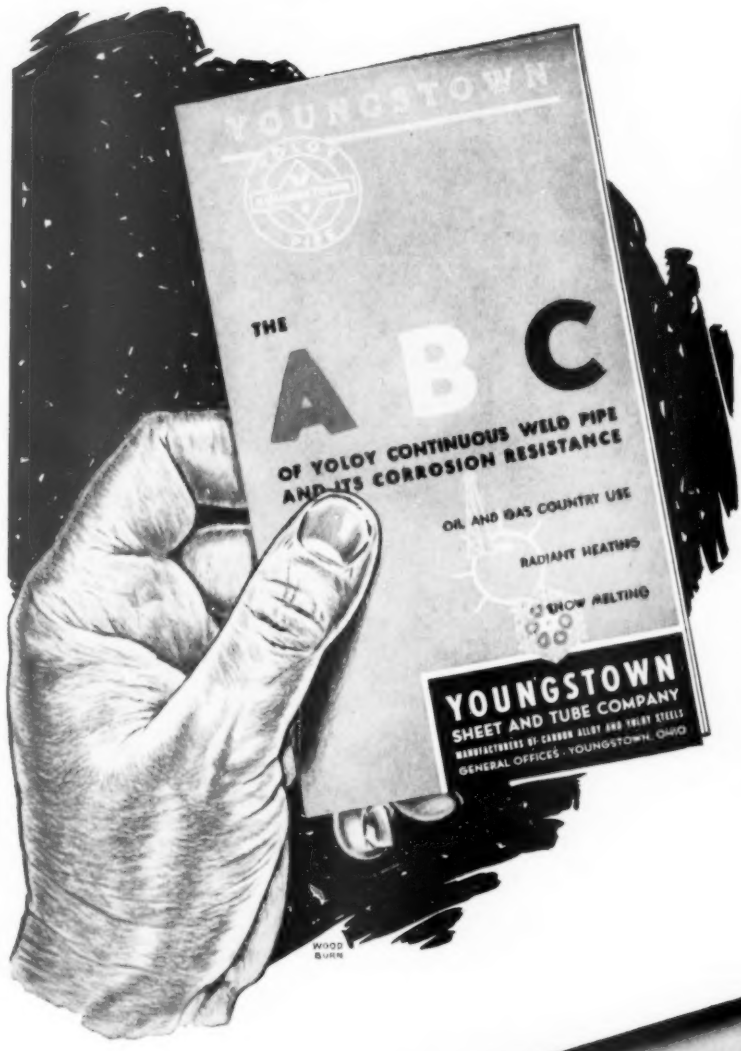
Geoffrey Jeffreys, 68, petroleum geologist and engineer, died recently in Jackson, Miss., following an illness of several months. He was senior member of the geological consulting firm of G. Jeffreys & Son. Prior to moving to Jackson in 1938, he worked with Caribbean Petroleum Co. and as a consultant in Venezuela and New York for several years.

Francis Thomas Hopp, 67, retired secretary and treasurer of Skelly Oil Co., died in Tulsa November 2 following a long illness.

Carleton D. Speed, Sr., 86, pioneer Texas producer, died recently in Corsicana, Tex. He brought in the first well in Corsicana September 23, 1898, and was honored by the Independent Petroleum Association of America in 1948 as the first person to produce oil in Texas for 50 years continuously.

Henry B. Phillips, 68, died recently at McAllen, Tex. He was a pioneer oil operator in Illinois, Oklahoma and Texas, and for 10 years prior to his retirement he owned and operated Anchor Drilling Co. of Carmi, Ill.

This DATA may solve YOUR piping problem



● Here is the up-to-date story of Yoloy Continuous Weld Pipe—a remarkable low alloy steel whose nickel-copper content gives it unique ability to withstand corrosion, abrasion and shock. These outstanding advantages combined with high strength, ductility and weldability make Yoloy Pipe an excellent selection.

Proved by 18 years of satisfactory performance, Yoloy is highly recommended by users in such service as radiant heating, snow melting, gas line gathering, brine lines and other industrial piping.

This new folder presents the facts and figures on Yoloy's physical and chemical properties, with data on sizes now available and other information you'll need to select Yoloy Continuous Weld Pipe to meet your special requirements. Write for a copy today.

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Bradford, Pa. — Founded 1880

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Columbus, Ohio, Dallas and Beaumont, Texas — Founded 1920

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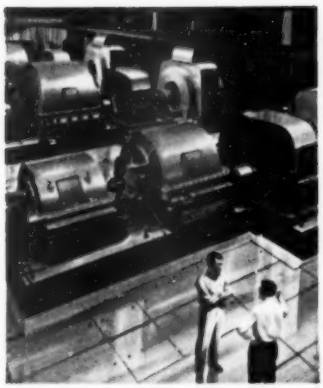
PACIFIC PUMPS, INC.
Huntington Park, Calif. — Founded 1923

ROOTS-CONNERSVILLE BLOWER DIVISION
Connersville, Ind. — Founded 1854

SECURITY ENGINEERING DIVISION
Whittier, Calif.; Dallas, Texas — Founded 1931

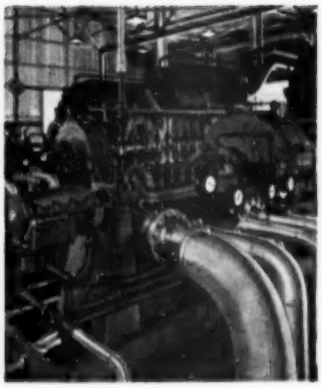
STACEY BROTHERS DIVISION
Cincinnati, Ohio — Founded 1915

DRESSER
MANUFACTURING DIVISION



ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind. Rotary positive blowers, gas pumps, centrifugal blowers, exhausters; positive displacement meters.

DRESSER MANUFACTURING DIVISION, Bradford, Pa. Oil and gas pipe couplings, fittings and sleeves—rolled and welded rings—welded fittings and flanges.



PACIFIC PUMPS, INC., Huntington Park, Calif. Centrifugal pumps, deep oilwell plunger pumps, hot oil and boiler feed pumps.

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SECURITY-DRESSER API SNACK BAR
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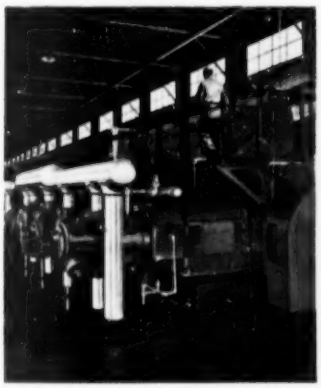
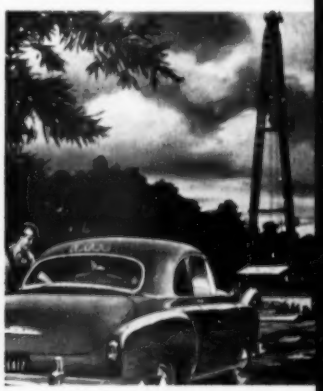


CLARK BROS. CO. DIVISION, Olean, New York. Engines and compressors—gas, steam and diesel driven.



IDECO DIVISION, Dallas, Beaumont, Tex. Derricks, drawworks, rambler drilling rigs, traveling blocks, rotary tables.

IDECO

SECURITY ENGINEERING DIVISION, Whittier, Calif., Dallas, Tex. Rock bits, reamers, casing scrapers, reamer rock bits, coring bits, Securaloy.

MAGNET COVE BARIUM CORP., Houston, Tex., Malvern, Ark. Magcobar drilling mud, Magcogel bentonite, Mylojel, Fiber Seal, Jel-Oil mud.

KOBE, INC., DIVISION, Huntington Park, Calif. Complete hydraulic oil field pumping systems, including the Kobe Free Pump.

Security

Magcobar

KOBE

Wire Rope at Work — Perhaps the most unusual building of our time is the State Fair Arena at the State Fair Grounds, Raleigh, N. C., shown here while construction was in progress. Startling in design, this steel-and-concrete structure is some 300 ft long by 300 ft wide, with sides that rise gracefully in perfect arcs. But its most striking feature is the gently-curved roof, which is supported entirely by Bethlehem steel cables.

Forming a grid with 6-ft x 6-ft squares, the cables, zinc-coated for resistance to corrosion, are securely anchored to the framework of the building and are fastened together at points of intersection. Bolt-clipped to the grid are corrugated metal sheets which, with the topping, constitute the roof proper. This ingenious application of steel cable—a member of Bethlehem's wire rope family—has already aroused wide interest and may well suggest a new trend in design and construction.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

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A.P.I. Preview . . .

Here are capsule digests of addresses and papers you will hear at the thirty-third annual meeting of the industry's largest trade group at Chicago this week.

A.P.I. Research Project 37—A Program of Production Research

IN the middle twenties forward-looking thinkers engaged in petroleum production began to recognize that oil and gas, as received at the surface, probably have quite different properties from those which exist in the underground reservoirs from which the fluids are produced, and that a knowledge of these differences may provide a basis for developments which may lead to substantial increases in the recovery of petroleum from oil fields.

The studies performed under Research Project 37 have produced many significant data regarding the behavior of hydrocarbons under reservoir conditions, and the results of these researches have had a marked effect on the technology of petroleum production. At the present time the project is concerned primarily with nonequilibrium behavior; and this, it is believed, may be of importance in production technology on a basis comparable with that concerning equilibrium studies.

Current effort is concerned primarily with gas and liquid diffusion under a wide range of pressure and temperature conditions, and with supersaturation under similar conditions. Initially, the work is restricted to simple mixtures of hydrocarbons. Other important activities of this project include preparation of a monograph on thermodynamic properties of hydrocarbon and related mixtures, as well as developments of techniques for increasing the range of applicability of "equations of state" for the prediction of hydrocarbon behavior.

J. G. SHERBORNE, Union Oil Co. of California Research Center, Brea, and **B. H. SAGE,** California Institute of Technology.

A.P.I. Research Project 47

THE initial phase of the over-all A.P.I. Project 47 program was Project 47a, placed at University of California in 1947. Completed and terminated in July 1952, this project resulted in the perfection of techniques to measure relative permeability and in the demonstration that, at least for the porous materials studied, the relative permeability to oil, in the presence of immobile interstitial water, is independent of the pressure gradient. Project 47b, begun in 1949 at University of Oklahoma, is directed to a study of the microscopic flow and displacement processes in porous beds by direct visual microscopic observations.

This research has established that, when oil and water flow simultaneously in the synthetic granular media used in the investigation, these phases occupy and flow through independent channels and do not share and crowd through the same pore passageways, except possibly at the channel interfaces. Differences in the manner in which displacing fluids progress through porous matrices, depending on their wettability for the solid surface and their relative viscosities, have also been revealed by this research.

Project 47d, just commencing at University of Texas, will be devoted to exploring fluid-solid interactions as these bear on wettability phenomena involved in the initial distribution of reservoir fluids in porous rocks and in their displacement from such rocks. Adsorption processes, heat changes, and free energy and entropy changes will be studied to determine quantitative measures of these interactions. It is anticipated that information of this type will throw much light on some of the outstanding problems of oil-recovery processes.

DR. ALFRED CHATENEVER, University of Oklahoma, and **N. HACKERMAN,** University of Texas.

The First 2 Years of A.P.I. Research Project 51

TWO years of full-scale operation of Project 51 have resulted in the establishment of criteria which should prove helpful in recognizing many depositional environments in ancient sediments. As the result of new techniques involving many lines of investigation, it is now possible to distinguish among Texas coast samples at least 14 environments in the embayment, on the

A.P.I. Issue Next Week

Next week's issue of the Journal will bring you complete coverage of this week's meeting—on the spot photographs, lobby talk, interesting sidelights, and many technical papers.

. . . This Week

An expanded technical section brings you specially selected articles on outstanding oil - industry developments. New practices and techniques in exploration, drilling, production, pipe lining, and refining are explored in 10 articles, plus our regular complement of Engineering Reference pages. What do you think the oil industry can and should expect from its technically trained personnel? See the article starting on page 103 for the opinion of an outstanding authority in this field.

A.P.I. Preview

barrier islands, and on the open Continental Shelf.

A considerable number of sedimentary units also have been distinguished off the east side of the actively growing portion of the Mississippi Delta. The results of this work have a particular application to the finding of ancient shore lines. The work also has indicated the importance of the barrier sand islands as potential stratigraphic sand traps. These elongate islands appear to include the most promising sediments for producing future permeable formations along the Gulf Coast, especially in the Texas area and perhaps also around the Mississippi Delta. Available well logs indicate that these masses have considerable thickness, and they apparently are being deposited between contemporaneous fine-grained sediments.

Evidence obtained to date indicates that very rapid deposition, at least as much as 2 ft. to 3 ft. per year, is occurring off the mouths of the large rivers, even where they empty into the open gulf. Appreciable postglacial deposition has occurred on portions of the open Continental Shelf, but elsewhere on the Gulf Coast shelf deposition has been slow or nonexistent during this interval of about 10,000 to 20,000 years. In the bays of Texas a rate of sedimentation of approximately 3 ft. per century is indicated.

FRANCIS P. SHEPARD, Scripps Institution of Oceanography, La Jolla, Calif., and **CLARENCE L. MOODY,** Ohio Oil Co.

The Myth of Monopoly

THIS author is of the opinion that unjustified charges against the oil industry stem from the public's misconception that this industry is a monopoly. Thus, to destroy this misconception would require that these false charges be ended. The author will attempt to do this by showing that the larger (or major) oil companies enjoy a decreasing share of the total market, proportionately; and that the industry is made up of 40,000 individual enterprises, large, medium, and small.

H. S. M. BURNS, president, Shell Oil Co.

What Should an Engineer Expect from a University Education?

THE proper function of the university is to contribute to the general education and to the scientific background of prospective engineers, rather than to their engineering experience. Experience can be obtained better in practical engineering situations. Science can be learned and understood best in a university. A university definitely does not, and cannot, "make" an engineer. An engineer needs extensive scientific study in a university, but he also needs real practical experience. Most people probably agree with this, but perhaps not all follow it to its logical conclusion as to the proper function of a university. There is often a tendency to attempt to deal in the university with matters which can only be done well on a job.

Really advanced work in engineering schools must be in the academic trandition—not in the tradition of craftsmanship. It must have a highly mathematical and theoretical basis. It is not a study of engineering practice, but of engineering theory. These men must devise the practice of the future. They are only incidentally concerned with the practice of the past. The thing to be emphasized is that such work is not a substitute for practical experience. It is a different type of thing. It is intended especially for research and development engineers and to help translate the latest scientific work into engineering terms.

DR. WILLIAM V. HOUSTON, president, Rice Institute.

Umpires in Management

THIS author will discuss the growing importance of financial and accounting officers as umpires in management. Because they can produce, analyze, and interpret factual material, these men have increasingly assumed this important industry function. Pointing out areas in which their influence on the American economic system already has been noted, the author will suggest that, in the future, this influence can grow to be much larger than their numbers. To do so, however, he will point out that much more remains to be done in the field of finance, and he will suggest several spheres in which research profitably could be made.

REESE H. TAYLOR, president, Union Oil Co. of California, Los Angeles.

Twin Keys to Successful Management

THIS author will address the Institute's financial and accounting committe as administrators, whose effectiveness rests squarely on the same pillars which support the effective officer in any other field, viz., organization and personnel. He will then discuss the basic principles of good organization—with particular stress on the necessity of delegating adequate authority along with responsibility.

In view of the practical fact that it is generally necessary to mold the organization to the available personnel, the author will discuss the various methods of the recruiting, training, and developing of personnel. He will stress that the program should not be limited to beginners or lower-ranked individuals, but should encompass all levels of supervision, in order to assure a never-ending stream of young executives who are growing through the organization.

In conclusion, the author will exhort the committee membership to discharge its full responsibility as members of their management team, and to see that each one has a sound organization manned with growing people who are able and eager to meet every challenge.

DONALD P. JONES, Sun Oil Co.

Future Development of Lease Storage Tanks

THIS paper will review briefly the general producing methods which influence lease tank batteries as they are today. The author will go to some length to emphasize the importance of obtaining a stable product at the tank battery, and how different producing methods affect the volume of stable product ofered by the producer to the pipe line. He will take as an example the lease product which is most difficult to make stable but which at the same time obtains maximum recovery. Hand in hand with his example, the author will draw the conclusion that the best lease tankage today is the bolted type.

Future lease tankage also will be considered briefly, for the reason that "fortune telling" is best done in a brief manner. But, based on present practices and continued expansion of automatic lease equipment, this paper will indicate the possibility of lease tankages being reduced in tank numbers and possibly eliminated under some circumstances.

KNOX B. HENDERSON, National Tank Co.

The Lummus Continuous Contact Coking Process

CONTINUOUS contact coking, a new process developed by Lummus Co., is reported to increase the yield of light oils from crude oil by high-temperature cracking of heavy residues. The residues are converted into gasoline, jet-engine fuels, furnace oils, and intermediate distillates. The heavy residue which lacks markets in many sections of the country is converted by contacting it with hot coke at temperatures higher than conventional refining methods. The process has the net effect of stretching each barrel of crude a little farther for the reason that the trend is toward an increased demand by consumers for lighter oils as jet fuels and for domestic heating oils, with a decreasing demand for heavy fuel oils normally consumed by railroads, steamships, and heavy industries.

VALENTINE MEKLER, A. H. SCHUTTE, and **T. T. WHIPPLE,** Lummus Co.

A Top-Management View Of Supervisory and Management Development

EMPHASIS in management development and supervisory training has usually been on training the other fellow—his needs and shortcomings being so much more transparent. Top management has been particularly sensitive to the shocking cost of poor human relations at the foreman and supervisory levels, and no expense has been spared on such training programs. Studies show that the success or failure of such efforts in changing the actual on-the-job behavior of a supervisor will depend almost entirely on whether the attitudes, values, and management philosophy and practices of the boss support what is taught in the training program. It is suggested that management development must begin with one's self—that we start by asking ourselves what we can do to improve the quality and effectiveness of our own leadership.

The body of the paper will then deal with the problem of how to improve one's own executive effectiveness. It suggests that, although the study of principles of organization

and administration and the developments of skill in specific management techniques may be of some value, the horsepower delivered by an executive to the operating gears of an organization will be determined primarily by the quality of his own motivation. His inner purposes, his basic values, the quality of his personal goals, the soundness of his business philosophy, the breadth and vision of his concept of the functions of the enterprise—these will be the yardsticks by which the dedication and productivity of his organization will be measured.

O. A. OHMAN, Standard Oil Co. (Ohio).

Reappraising the Department of Commerce Role in Transportation

THE federal Government is now studying possible methods of returning basic responsibilities for transportation to private enterprise. The sale of the Federal Barge Lines removes federal competition in one field while at the same time profiting taxpayer and U. S. Treasury alike. To improve national security, a trade-in-and-build program for tanker operations has been proposed to Congress through the department's Maritime Administration. This, plus liberalized federal insurance of private loans for shipbuilding, will help to maintain an adequate supply of tankers for the National Shipping Authority and the Voluntary Defense Tanker Pool. In the aviation field, the Government's efforts have been directed toward improving efficiency and safety through installation of air navigation aids.

ROBERT B. MURRAY, JR., Under Secretary of Commerce for Transportation, Washington, D. C.

Wanted—A New Lubricant

THIS speaker will say that New Hampshire has enjoyed 20 years of progressive, broad-minded cooperation from the oil industry. To solve the over-all highway problem, a new lubricant—with an additive which dissolves away petty fueds, bickering, etc., and which leaves undiluted common sense—is required. It is hoped that the petroleum industry can develop this through its vast resources of technical know-how. A 13-point program for accomplishing this will be presented.

MAJ.-GEN. FRANK D. MERRILL, New Hampshire Public Works and Highways Commissioner.

Operations on the Tidelands

THIS author will explain the provisions of the Submerged-Lands Act signed by President Eisenhower on May 22, 1953, which restored to the coastal states the submerged lands within 3 miles of the coast, or 3 leagues of the coast in the case of some of the Gulf Coastal states. He will discuss the laws, regulations, and rules of the states over submerged areas returned to them. He will also explain the provisions of the "outer Continental Shelf lands Act" which placed under the jurisdiction of the United States all of the bed of the sea beyond the lands returned to the states out to the edge of the Continental Shelf. He will discuss the power of the federal Government over the outer Continental Shelf and the type of rules and regulations which will promote adequate development of the resources under the control of the United States.

CLAYTON L. ORN, Ohio Oil Co.

Formulas for Selecting Pipe-Line Diameter for Minimum Investment

WHEN plans are being made to transport petroleum products by pipe line, one of the questions which confront the builder concerns choice of the size of pipe to lay. He can lay a very large pipe line, which will require large sums in initial cost, but which will require initially a smaller outlay for power for pumping. Or a smaller line can be laid at lower cost for pipe-line construction, but this will require a larger investment in power to force the same amount of liquids through the smaller pipe.

The proper balancing as between the cost of power and the cost of pipe involves the choice of a pipe size which will require the lowest investment in the pipe-line system. Phillips Petroleum Co. has developed formulas and charts which will aid materially in the direct determination of the pipe-line size for liquid petroleum-product transportation which will yield the optimum balance between line costs and power costs and which will result in the lowest total investment in a pipeline system.

GEORGE F. DOWNS, JR., and **GEORGE R. TAIT,** Phillips Petroleum Co.

Operations on Federal Lands In the Rocky Mountains

THIS is a broad topic, but a few of the major points of interest will cover generally the nature and type of federal lands in the Rocky Mountains, as well as a few of the operational and procedural problems—such as the difficulties resulting from acreage limitations imposed by the federal Government and the filing of bonds and notices under the federal regulations.

In this connection, particular emphasis will be given to the relief from these problems which can be obtained through operations under unit agreements for the development and operation of prospective areas. The conclusion will deal primarily with the advantages and disadvantages, as well as with a few of the mechanics, of unitizing federal lands.

LON J. PUTNAM, Gulf Oil Corp.

Some Results of D.R.I. Investigations

DRILLING RESEARCH, INC., is a nonprofit organization formed to study oil-well drilling methods other than conventional rotary or cable-tool methods. The research is supported by a group consisting of several oil companies, drilling contractors, and a supplier. In the course of D.R.I.'s investigations, work has been done on drilling by such equipment as the electric arc, rocket exhaust, and high-speed abrasive wheels.

In connection with methods involving high-speed chipping action up to 1,400 blows per second, it became necessary to know more about what takes place when each chip is formed. A report is given of this last activity, which develops the importance of the amount of energy per blow as the predominant factor in increasing drilling rates.

DR. JOHN V. PENNINGTON, Drilling Research, Inc.

Recent Advances in Pipe-Line Construction

THIS paper is composed of four basic parts, viz.: (1) a trace of the rise of pipe line construction companies from 1920 to the present; (2) an attempt at enumeration of some of the more important advances in the techniques of pipe-line construction; (3) a description in some detail of the work done in crossing the Straits of Mackinac for Lakehead Pipe Line Co.; and (4) some of the problems encountered in building the Trans Mountain pipe line.

C. C. BLEDSOE, Midwestern Constructors, Inc.

Huge Discovery Task to Require More Drilling

RISING production requires much higher oil-recovery rates than ever before in the United States. Drilling activity must be expanded above present peak volumes if sufficient oil is to be found to satisfy enlarged future needs. It is urgent to find ways to reduce current high drilling costs. Otherwise the drilling of more wells will impose an unbearable financial burden on the industry. Factors other than the magnitude of the discovery task also indicate a need for increased drilling.

Fewer barrels of new oil are being found, and fewer wells are being drilled in relation to producing rates, than customary before the war. Furthermore, a much larger portion of the wells completed are dry holes and a decreasing portion are oil wells. Lower drilling costs would encourage greater drilling activity, and would lead to the discovery of sufficiently enlarged quantities of oil to satisfy the increased requirements of the future.

WARREN L. BAKER, Gulf Publishing Co.

Oil and the Atom: Partners or Competitors?

THE partnership between oil and the atom is proved by the many examples of the usefulness of the "atom" to the oil industry. In geophysical exploration, drilling, production, pipe-line transportation, refinery practice, and research, atomic-energy techniques and byproducts have been seized upon by the petroleum industry and turned to good use.

As competitors, the case for the atom rests on future developments which will require years of experimentation and experience. In

(Continued on page 149)

PIPE-LAYING BARGE at Mississippi River. The 3,700-ft. crossing was made using the laying barge, with individual sections made up on the bank and tested before being tied on to the rest of the line.

THE RAINS CAME . . . and posed problems such as this. Record-breaking rainfalls, totaling 31 in., plus miles of water-logged, swampy country and many river crossings, faced this line's builders. (Panama-Williams Co. photos).

WATER, WATER, EVERYWHERE

Operations Simplified, Costs Pared, in New Evangeline Products Pipe Line System

by F. Lawrence Resen
Gulf Coast District Editor

SEVERAL engineering developments were incorporated into the design of the Evangeline Pipe Line System, a new products line extending from Port Arthur, Tex., to Baton Rouge, La. These include:

- "Doughnut" tank foundations at the Port Arthur tank terminal.
- Booster pump bypass at Port Arthur terminal.
- Meter-run equalizing line and new-type strainer at Baton Rouge.
- Remote-controlled booster station at Lake Charles.

The Evangeline system is owned and operated on an undivided interest basis by Texas Pipe Line Co., Gulf Refining Co. (pipe-line department), and Sinclair Pipe Line Co. Onstream date for the line was September 24.

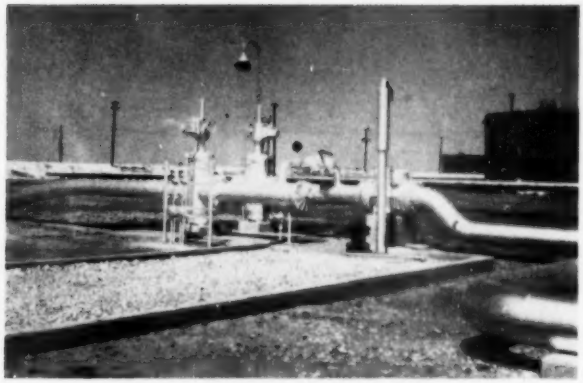
The 16-in. carrier, which traverses a distance of 191 miles, was designed to handle 96,000 bbl. per day of products initially and has an ultimate capacity of 175,000 bbl. per day.

The system originates at its Port Arthur station, where products are received from The Texas Co. and Gulf Oil Corp. refineries at Port Arthur and Sinclair Pipe Line Co.'s products system extending from Houston to Port Arthur, then to a booster station at Lake Charles, where products are received from Cities Service Refining Corp.'s refinery, and terminates at Plantation Pipe Line Co.'s Baton Rouge station.

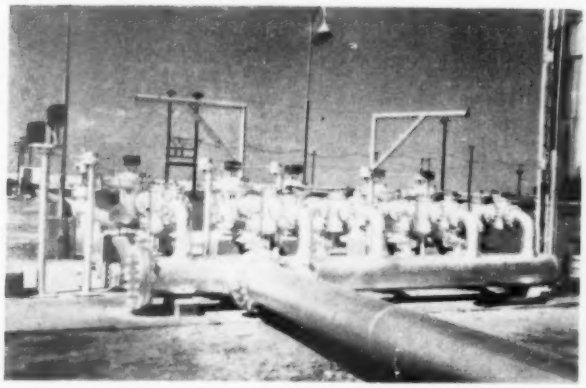
Provisions have been made for deliveries to proposed sales terminals near Opelousas, La. (Gulf), and Baton Rouge (Gulf and Texaco), but the bulk of the products handled will be transhipped eastward over the Plantation Pipe Line System.

Engineeringwise, the system is featured by unique engineering applications at its stations and its remote-controlled booster station; construc-

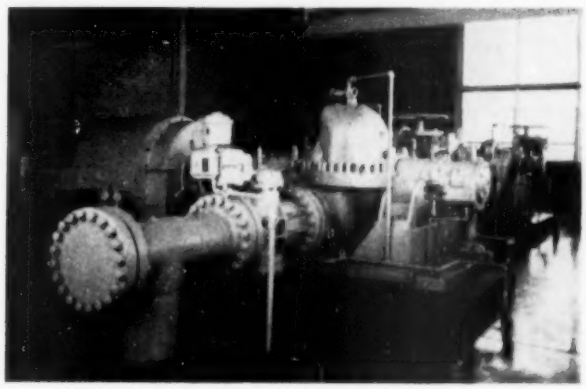
MODERN BUILDING houses pumps and station controls.



SCRAPER TRAP at Port Arthur station.



MULTIPLE METER BANK at Port Arthur station.



TWO MAIN PUMPING UNITS at Port Arthur station.

tionwise, it was featured by its 14 water crossings, including the Mississippi, its crossing of water-soaked rice fields, and the handicaps of a record-breaking rainfall totaling some 31 in.

Engineering Features

Many interesting engineering developments were used in the Evangeline system to simplify operations as well as to save on the cost of the system.

Tank foundations . . . At Port Arthur are located 14 tanks, all with a 40-ft. oil height. Eleven are 80,000-bbl. tanks and three are 45,000-bbl. tanks. These are used to receive incoming products from the three shipping refineries and for segregation and batching of products through the system.

In this locality the soil foundation is quite poor and safe loading recommended was 1,500-1,700 lb. per sq. ft. However, the 40 ft. oil height in the tanks, plus the concrete foundation, plus the weight of the tank steel gave a loading of approximately 2,100 lb. per sq. ft.—considerably above the recommended safe loading.

A convenient method of supporting loads in this type of soil is to drive piling and place a mat over this piling, but considerable expense is involved in providing such a foundation. The Texas Pipe Line Co. engineers came up with a solution to this problem in the form of a doughnut-shaped concrete foundation, which provided an inexpensive means of extending the bearing area.

The outer diameter of the bigger tanks is 120 ft., and the concrete ring was designed with an outer diameter of 135 ft. and an inner diameter of 105 ft. This served to have the tank shell evenly on the ring, with concrete extending 7½ ft. on either side of the periphery of the tank. The rings were made of reinforced concrete and constructed by following usual highway methods.

The concrete was laid to a thickness of about 2½ ft. at the center of the ring and tapered outward and inward to a thickness of about 1 ft. at its outer and inner edges. The top taper was held to 6 in., which was considered sufficient for drainage purposes. The ring was designed thick enough and reinforced sufficiently to withstand torsion produced by the tank's settling on the ring.

The resulting foundation had a bigger diameter than the individual tank and served to extend the bearing area sufficiently so that the loading was reduced to 1,600 lb. per sq. ft. over the entire foundation's surface. This is well within the safety load limits and was achieved at a much lower cost than piling.

Booster bypass . . . At the Port Arthur station, each tank is equipped with a booster pump for taking suction out of the tank and placing sufficient pressure on the outgoing tank line so that the mainline pumps will at all times have adequate suction pressure. A provision was made to bypass this pump when filling the tank, thereby eliminating the need of a separate filling line or the use of reverse flow through the booster pump.

A motor-operated double-swing check valve is incorporated in this bypass downstream of the booster pump where the bypass joins the outgoing tank line. When necessary to close the bypass, the clapper of the valve swings upward and seats itself against the bypass opening and at the same time opening the discharge of the booster pump. In reverse operation the clapper swings downward closing the discharge to the booster pump and opening the bypass line, allowing product to enter the tank.

Double-swing check valves in this service have given serious trouble in

(Continued on page 139)

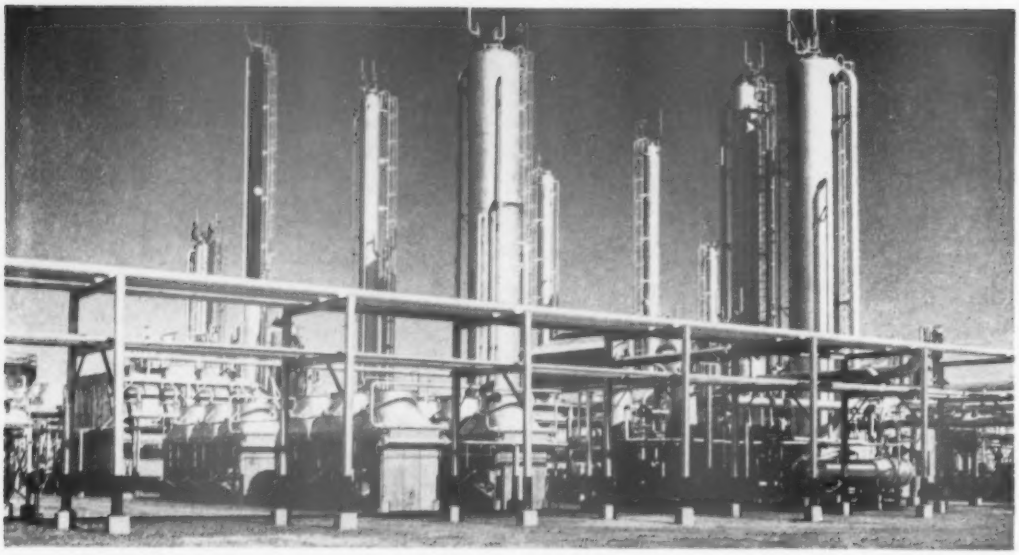


Fig. 1—Process area of Elk Basin unit plant which generates inert injection gas and recovers natural gasoline and elemental sulfur. Left to right are: oil still, demethanizer, oil absorber, solution reactivator, depropanizer, debutanizer, deethanizer, second-stage amine contactor and first-stage amine contactor.

PERFORMANCE REPORT

Injection of Atmospheric Nitrogen in Elk Basin Pressure Maintenance Still Paying Off

Decline in reservoir pressure arrested and later increased 100 psi. Recovery efficiency is high and operations to date are considered highly successful

by John E. Lang

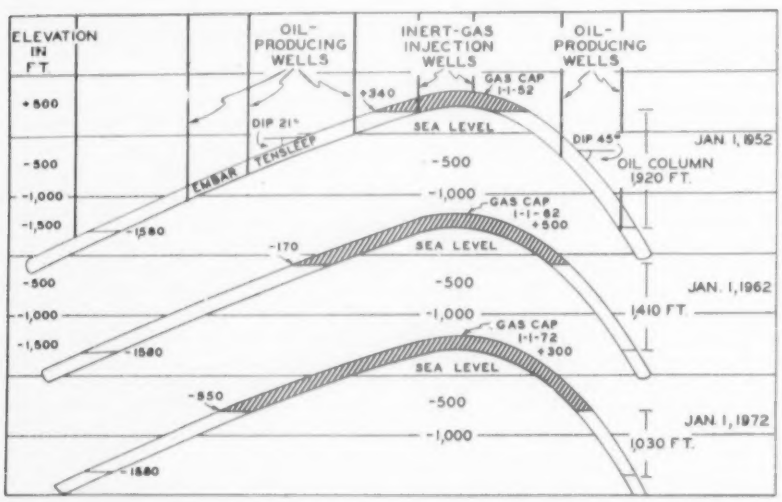


Fig. 2—Cross-section of Elk Basin Embar-Tensleep reservoir, showing position of gas-oil contact at various stages of reservoir depletion.

THE pioneer project for the injection of atmospheric nitrogen in pressure maintenance is now entering its fifth year of successful operations and shows an increased bottom-hole pressure even though production has been increased.

Because available supplies of natural gas in the vicinity of Elk Basin's Tensleep reservoir were insufficient, inert gas has been injected since September 1949. The plant which processes the injection gas also recovers elemental sulfur from the reservoir's effluent sour gas.

Elk Basin field is located on the Montana-Wyoming border, approximately 200 miles northwest of Casper, Wyo., and approximately 50 miles east of Yellowstone Park. The field was found on a typical Rocky Mountain anticline where the structural features of the underground reservoir are apparent at the surface.

Commercial hydrocarbon accumulations have been found in four distinct sedimentary beds. Although oil was first discovered in the Frontier sands in 1915, and extended to the gas-bearing Dakota formation in 1922, it was

Author is with Stanolind Oil & Gas Co., Casper, Wyo. Paper presented at meeting of Interstate Oil Compact Commission.

not until late 1942 that the first oil well was completed in the Tensleep sand. Late in 1946 commercial oil production was also obtained in the Madison limestone.

The largest oil reserve is in the Tensleep sand which is found at an average depth of 4,900 ft. Oil-productive area covers some 6,350 acres. It is approximately 7 miles long and 2 miles wide, with a closure of some 2,000 ft. from the apex to the oil-water contact. The formation dips approximately 21° on the west flank, while the dip on the east flank is much steeper, averaging 45°.

Tensleep reservoir . . . The Tensleep is a well-cemented sandstone of Pennsylvanian age immediately overlain by the Embar dolomite. The oil-bearing sand is approximately 200 ft. in thickness, being interspersed with dense stringers of dolomite. The rock permeability and porosity are generally good although the sand grades into dolomite with decreasing permeability and porosity in some areas.

The reservoir oil is a typical Wyoming heavy, high-sulfur crude averaging 30° A.P.I. gravity and was undersaturated with gas at the original reservoir pressure. Extensive sampling and testing has established the fact that the characteristics of the reservoir oil vary with the structural position of the wells from which the samples are taken.

Although the original reservoir pressure was 2,240 psia., the saturation pressure varied from 1,250 psia. at the top of the structure to 505 psia. at the lowest elevation sampled. The corresponding amount of gas in solution varied from 480 to 106 cu. ft. per barrel of oil. These variable characteristics of the reservoir have complicated reservoir analyses.

At the time of discovery, the Tensleep solution gas contained the highest hydrogen sulfide content of any field in the Rocky Mountain region. Hydrogen sulfide content varied from 4 per cent to more than 17 per cent by volume.

Plan for Secondary Recovery

An engineering committee was appointed to make a detailed study of the Tensleep reservoir and to investigate various producing practices. It was apparent from the early pressure-production performance that an active water drive was not present to aid in recovery of the oil. Therefore, under nonunitized operations the oil recovered would be primarily due to solution-gas drive, a producing mechanism which results in relatively low recovery efficiency.

Although the structure was favorable for gravity drainage to operate, this producing mechanism could not be operated as efficiently with unrestricted gas production normally prevalent under nonunitized operations as it could be under a unitized pressure maintenance operation.

With unitization, selective production to prevent waste of gas, and initiation of some form of pressure maintenance, it was anticipated that high producing rates could be maintained, and recovery efficiency improved considerably. Some increased operating efficiency would also result from unitization.

Although recovery efficiency by water drive is generally high, the drilling of injection wells and development of dependable water source would have been quite expensive. However, high recovery efficiency could also be expected from gas injection at the crest of the structure since the structural features at Elk Basin are favorable for the segregation of gas and oil. Fig. 1 illustrates how the reservoir would be operated with this type of secondary-recovery program. Gas injected through wells at the top of the structure would move downstructure to replace oil withdrawn from wells below the gas-oil contact.

Insufficient gas . . . Although produced gas is reinjected in many projects, the amount remaining at Elk Basin after processing would not be sufficient to maintain reservoir pressure. Neither was there an adequate reserve of uncommitted gas within 100 miles of the field. Due to the expense of develop-

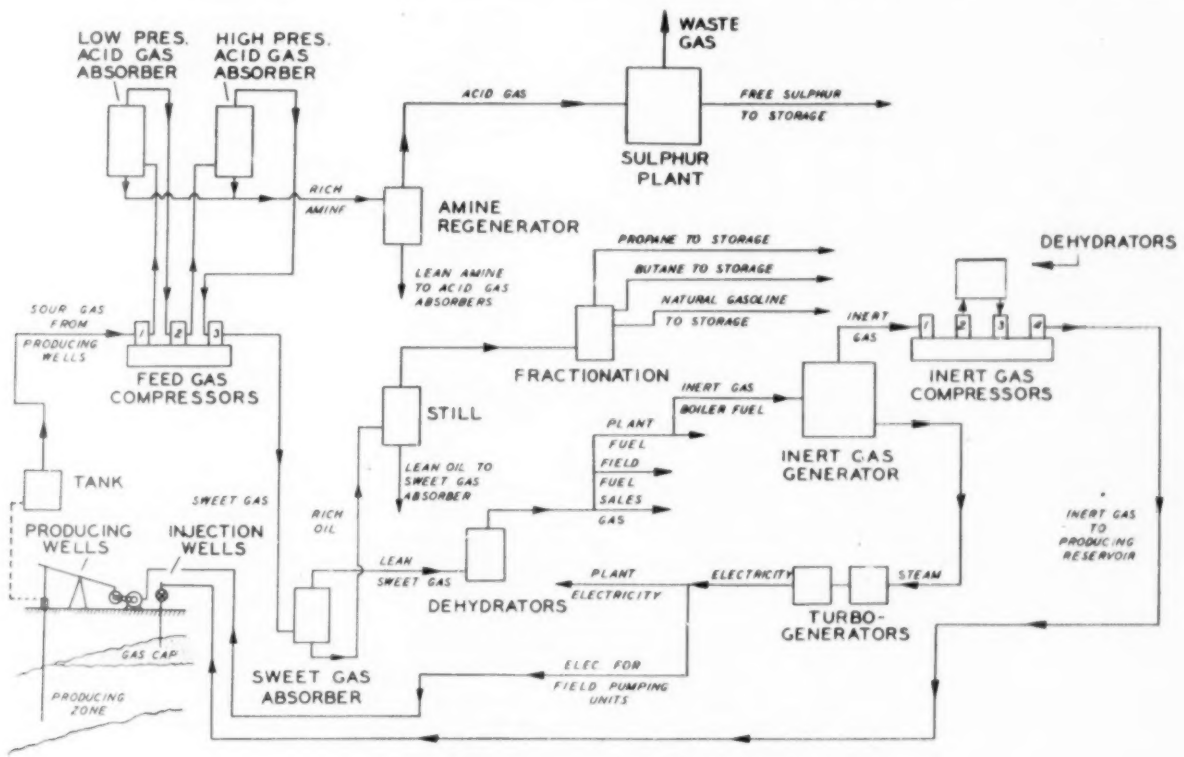


Fig. 3—Elk Basin repressuring plant flow diagram.

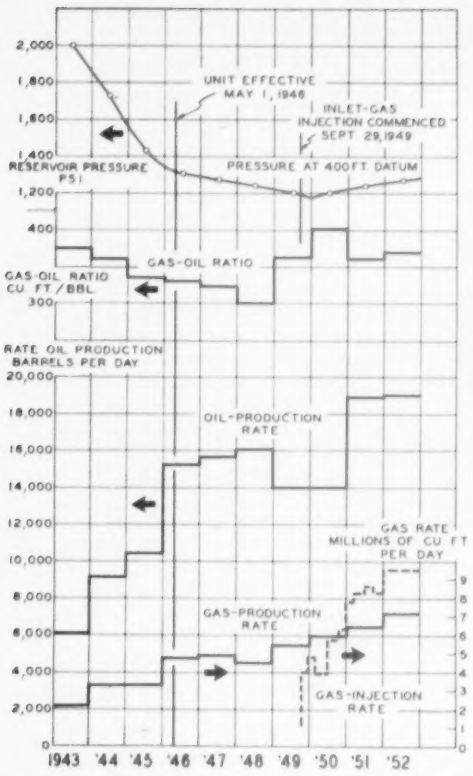

UNIT EFFECTIVE MAY 1, 1946
INLET-GAS INJECTION COMMENCED SEPT. 29, 1949
RESERVOIR PRESSURE PSI
PRESSURE AT 400 FT. DATUM
GAS-OIL RATIO
GAS-OIL RATIO CU FT/BBL
RATE OIL PRODUCTION BARRELS PER DAY
OIL-PRODUCTION RATE
GAS RATE MILLIONS OF CU FT PER DAY
GAS-PRODUCTION RATE
GAS-INJECTION RATE
1943 '44 '45 '46 '47 '48 '49 '50 '51 '52

Fig. 4—Elk Basin, Embar-Tensleep reservoir performance.

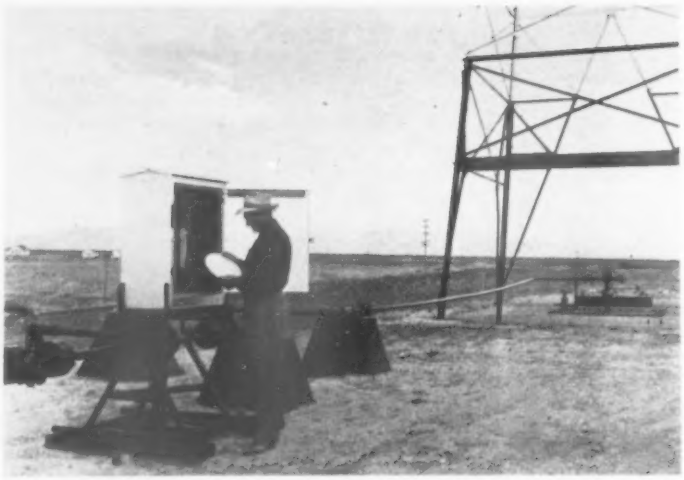


Fig. 5—Meter house at inert-gas injection well in Elk Basin field.

ing an adequate water supply and lack of outside gas that could be purchased, consideration was given to the generation of inert gas of which an adequate supply could be obtained from plant operations. Studies indicated that approximately nine volumes of inert gas could be obtained by burning one volume of hydrocarbon gas.

Inert gas was expected to displace oil essentially as would natural gas and by crestal injection further increase the oil recovery and maintain ability to produce oil at high rates.

The engineering committee's findings were presented to the operators in September 1944, and after further study and negotiations, all formations below the top of the Embar formation were unitized May 1, 1946. Stanolind Oil & Gas Co. was appointed unit operator. Other major working-interest owners include Carter Oil Co., Ohio Oil Co., Continental Oil Co., Argo Oil Corp., Sinclair Oil & Gas Co., Phillips Petroleum Co., and R. S. Shannon.

Work began immediately on the design and construction of facilities to conduct a nitrogen-injection operation in the Tensleep.

Plant Design

The pressure-maintenance plant at Elk Basin was designed as an integrated unit to process the produced gas, recover hydrocarbons for sale, remove hydrogen sulfide and convert it into elemental sulfur for sale, and provide sufficient inert gas for the gas-injection operation. The plant was also designed with sufficient electric-generating capacity for plant and field use. A schematic flow diagram is illustrated in Fig. 3.

Solution gas produced from a well completed in the oil zone of the reservoir flows with the oil to one of the consolidated tank batteries where the gas is separated from the oil. The oil separators at the batteries are elevated and operate at approximately 2 psig. Vacuum operation is avoided in order to prevent possible air infiltration, thereby minimizing potential corrosion by hydrogen sulfide in the gas-collection system.

The gas-collection system is designed with two main lines, one from the north part of the field and the other from the south part. The entire gas-collection system is installed aboveground with sloping grades which provide a minimum of low points for the collection of condensate forming in the gas gathering system.

As field gas enters the plant it passes through a scrubber designed to remove entrained crude oil, scale, and other foreign material. Gas passes from this scrubber into the first-stage suction header at 0.5 psig. and is compressed in the first stage of compression to approximately 45 psig.

H_2S removal system . . . The first-stage discharge gas is cooled, passed through a separator and sent to the low-pressure amine absorber where it is partially stripped of hydrogen sulfide and almost completely stripped of carbon dioxide. The gas is then further compressed to about 150 psig. in the second stage, cooled, and passed through a separator, and then treated in the high-pressure amine absorber for hydrogen sulfide removal to a maximum residual concentration of 0.25 grains H_2S per 100 standard cubic feet.

The sweet gas is then compressed in the third stage to 525 psig., passed through the third-stage aftercooler, and charged to the main absorber.

The rich amine solution (with its load of acid gas) is pumped through heat exchangers to the amine regenerator, a steam-heated stripping tower where H_2S and CO_2 are removed from the solution. The regenerator is filled with ceramic Raschig rings rather than steel bubble trays because of the corrosive effects. The overhead product from this reactivator comprises the feed gas to the sulfur plant.

Sulfur-recovery system . . . Design of the Elk Basin sulfur-recovery system is based on a modification of the Claus process. Variations of this process have been used in Europe for a number of years but the Elk Basin plant was one of the earliest applications of this process in the United States.

Acid gas from the amine unit, containing approximately 75 per cent H_2S and 25 per cent CO_2, enters the sulfur-recovery unit through a scrubber which removes entrained water. One third of the acid gas from the inlet scrubber

is burned with controlled air, in a specially designed boiler to produce sulfur dioxide. Heat of combustion is used to generate 200 psig. saturated steam.

The combustion chamber of the boiler is operated at a pressure sufficiently high (about 3 psig.) to force the combustion products through the remainder of the process without blowers or compressors.

Combustion products from the boiler, which contain sulfur dioxide, are commingled with the unburned portion of the acid gas, then pass to the first reactor which contains a bauxite catalyst. The design inlet temperature of the reactor is 450° F.

Reduction of the sulfur dioxide and oxidation of the hydrogen sulfide occurs over the catalyst, releasing the elemental sulfur. The heat of reaction raises the temperature to approximately 740° F. and at reactor exit conditions the sulfur is in the vapor state. The reactor effluent gases are cooled to approximately 300° F. in a condenser-separator which condenses the sulfur vapor and generates low-pressure steam at approximately 35 psig.

Reaction is not completely effected in one reactor, therefore the remaining unreacted gases are reheated above the sulfur dew point to a temperature of 450° F. and pass to a second reactor where reaction proceeds substantially to completion. The exit gas from the second reactor flows to a second condenser-separator where the sulfur vapor is condensed at about 300° F.

The condensed liquid sulfur flows from the conical bottoms of both condenser-separators to a surge tank, and is pumped to storage through a steam-jacketed line.

The plant has a capacity to process 2,900,000 s.c.f.d. of acid gas per day and produce 80 long tons of sulfur per day.

Sweet-gas absorption and fractionation. The sweet gas from the third stage of the field gas compressors enters the main absorber where approximately 90 per cent of the propane and substantially all of the heavier hydrocarbon components are extracted by the absorption oil at a pressure of 520 psig. The lighter hydrocarbons, namely methane and ethane, pass overhead to the inert-gas boiler, sales, and fuel-gas system.

The absorption oil then passes through a demethanizer, thence to a rich-oil still where approximately 3,000 lb. of steam per hour is used to separate the liquid hydrocarbons (gasoline, butane, and propane) from the absorption oil. The liquid hydrocarbons pass through the fractionation units where propane, butane, and natural gasoline are recovered.

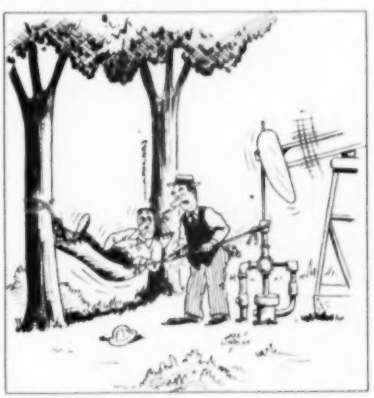
Inert-gas system . . . The inert gas, which is used for maintenance of reservoir pressure, is generated from one of two plant boilers. This boiler is of standard water-tube gas-fired-type construction but is equipped for close combustion control and has a pressure casing. The inert gas is approximately 90 per cent nitrogen and 10 per cent carbon dioxide with small amounts of carbon monoxide, sulfur dioxide, nitric oxide, and oxygen. Every effort is made to eliminate oxygen to minimize corrosion.

The inert gas is compressed to 1,500 psig. by five 1,200-hp. four-stage compressors. The inert-gas system is designed to deliver a maximum of 15,000 M.c.f. per day of inert gas to the field distribution system.

About 70,000 lb. of steam per hour is used to generate power and in processing. Consideration of steam and power requirements, particularly the large demand for low-pressure process steam, indicated that turbo generation of electric power would be more economical than gas-engine generation. Electricity is generated for both field and plant use. Two 1,000-kw. 2,400-volt, 3-phase, 60-cycle generators are directly connected to steam turbines which operate on 440-psig. steam superheated to 650° F.

As soon as unitization became effective, Stanolind, as unit operator, took over all Tensleep operations. A gas cap had started to develop at the crest of the structure, and all wells in this area were immediately shut in to prevent wasteful gas production. All wells were subjected to detailed production tests and a system of selective production was established for maximum efficiency pending completion of the plant.

Field operating efficiency was improved by consolidating tanks into eight strategically located batteries and much producing equipment was standardized. After the plant was completed, all pumping units were converted to electric power.



". . . I don't care if it is your day off!"

Eight crestal wells, four on the north dome and four on the south dome (as shown on Fig. 2) were selected as injection wells and the injection system was completed.

The plant began processing gas in March 1949. Utilizing natural gas, injection tests were commenced in the summer of 1949, and full-scale nitrogen injection began in late September the same year.

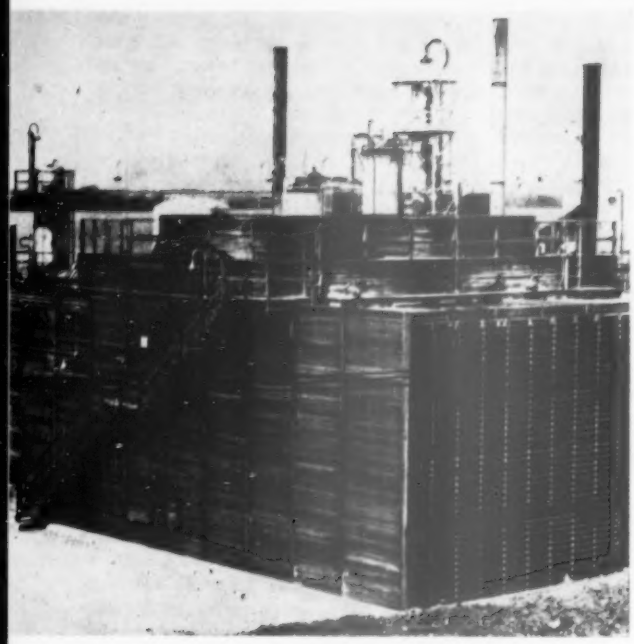
Reservoir performance . . . The performance of the Tensleep reservoir since discovery is summarized in Fig. 4. The effect of unitized operations and nitrogen injection is clearly evident. It will be noted that the reservoir pressure was declining rapidly prior to unitization although the oil-producing rate was in the order of 10,000 bbl. per day. The field was unitized in May 1946.

With selective production following unitization, the pressure continued to decline, but the rate of decline was not as great even though the producing rates had increased to an average of 15,000 to 16,000 bbl. of oil per day. Some leveling of the pressure decline curve can be expected when reservoir pressure drops to the saturation pressure. However, in this instance pressure had dropped to the saturation pressure in only a relative small area at the crest of the structure.

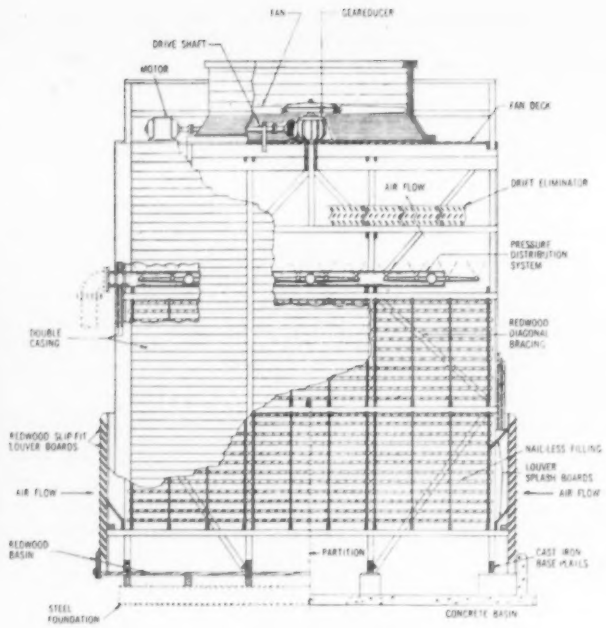
The leveling of the pressure-decline curve during the latter part of 1946, all of 1947, 1948, and the first part of 1949 can be attributed primarily to the shutting in of high-gas-oil-ratio wells, and the initiation of selective oil production whereby the oil was produced from downstructure wells which had lower gas-oil ratios.

It will also be noted that after commencement of nitrogen injection in the latter part of 1949, the decline in reservoir pressure was arrested, and by the middle of 1952 the pressure had increased approximately 100 psi. even though oil-producing rates had been increased to approximately 19,000 bbl. per day. The general plan of operation is to maintain reservoir pressure near the current level of approximately 1,300 psi.

Gas-oil ratios . . . Gas-oil ratios, an index of production efficiency, have remained near solution-gas ratios although it has been necessary to produce some gas-cap gas for testing and for plant balance during periods of low oil production. Individual well tests reveal that the gas cap is expanding uniformly down the structure. By observation of gas-oil ratios and by measuring the reservoir pressure in a number of wells, it is possible to locate the gas-oil interface with relatively good accuracy.



Cooling tower in refinery service.



Section of typical counterflow tower.

Here's a new method of

Calculating Cooling-Tower Performance From Test Data (Actual vs. Predicted)

by F. B. Read and L. T. Mart

THERE is need for a simple and rational method of analyzing cooling-tower test data as a check against predicted performance. Numerous equations have been developed for expressing relative capacities of cooling towers under varying conditions; however, in general they require the use of higher mathematics.

The processes involved in a cooling tower are complex, and it is difficult to obtain the test data necessary to make an accurate and comprehensive heat-transfer analysis. Extensive research and testing facilities are therefore necessary for the establishing of reliable basic rating data.

Any means of evaluating cooling-tower performance may be considered as a yardstick. This yardstick, however, is of no value until it has been calibrated by applying the method of analysis to actual test data. The performance of a cooling tower is dependent upon design characteristics which include type, size, shape, interior arrangement, etc., in addition to such variables as mass air rate, water loading, cooling range, and wet-bulb temperature of the air. Therefore, it is assumed that the user of a large industrial tower will want to test his cooling unit to check actual performance against specified conditions.

Authors are associated with the Marley Co. This material is an application of the information contained in "Acceptance Test Procedure for Mechanical Draft Towers" as published by the Cooling Tower Institue, and within the accuracy therein enumerated.

Performance Factors

The numerical factors in Table 1 provide a means whereby tower test data can be used to determine if the tower is performing reasonably close to specified conditions or if it is widely deficient in performance. The test factors in Table 2 permit checking the performance of industrial towers at other than design atmospheric wet-bulb temperatures.

The data in each table are very general, and have been developed from calculated performance ratings of various types of wood-filled mechanical-draft towers. These factors are applicable to the test data of any such towers within design limits of 12° to 35° F. cooling range, 6° to 16° F. approach to wet-bulb, and for summer weather conditions of 70° to 80° F. wet-bulb temperatures for reasonable accuracy. The tabulated factors represent average water loading, as is also indicated by the broken line in Fig. 1; the accuracy will depend somewhat upon the specified capacity and design conditions of the tower under test.

Test factors in Table 1 and Fig. 1 are based upon average water loading for a tower; when the water quantity increases or decreases, there may be slight inaccuracies in the calculation of tower performance. Further inaccuracy may be attributed to the inability to adjust all types of cooling towers to a common performance factor. However, as test conditions approach de-

TABLE 1—TOWER TEST FACTORS

Per cent of test cooling range to design range	Per cent of test approach to design approach												
	80	85	90	95	100	105	110	115	120	125	130	135	140
90	1.130	1.067	1.015	0.970	0.926	0.889	0.852	0.818	0.787	0.759	0.734	0.710	0.686
92	1.148	1.085	1.033	0.986	0.941	0.903	0.868	0.832	0.801	0.773	0.748	0.723	0.698
94	1.165	1.102	1.049	1.000	0.957	0.918	0.882	0.846	0.814	0.786	0.760	0.735	0.710
96	1.183	1.120	1.065	1.016	0.971	0.932	0.895	0.860	0.827	0.798	0.772	0.746	0.721
98	1.200	1.135	1.080	1.030	0.986	0.947	0.910	0.874	0.840	0.810	0.783	0.757	0.732
100	1.218	1.150	1.095	1.044	1.000	0.960	0.922	0.888	0.852	0.822	0.795	0.768	0.743
102	1.234	1.177	1.110	1.059	1.014	0.973	0.936	0.900	0.864	0.833	0.806	0.779	0.753
104	1.250	1.181	1.125	1.072	1.028	0.987	0.949	0.912	0.876	0.844	0.817	0.789	0.763
106	1.266	1.198	1.140	1.089	1.042	1.000	0.960	0.923	0.888	0.855	0.827	0.799	0.772
108	1.281	1.212	1.154	1.101	1.055	1.011	0.971	0.934	0.899	0.866	0.836	0.809	0.781
110	1.295	1.225	1.168	1.115	1.068	1.024	0.983	0.946	0.909	0.877	0.845	0.818	0.793

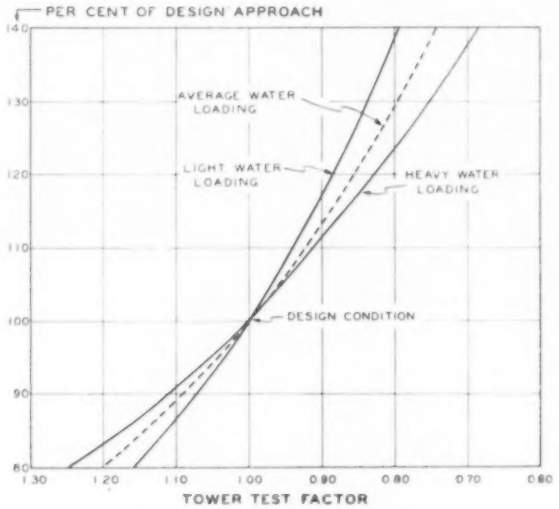


Fig. 1—Effect of water loading on the tower test factor.

sign requirements the accuracy will be improved. (Refer to Fig. 1.)

Operating test conditions must be reasonably close to the original design (purchase conditions), otherwise errors will be introduced due to variation in design of the equipment. The weather, water capacity in gallons per minute cooling range, and total heat load during test should approximate conditions for which the tower was purchased with tolerance or variation being within the permissible limits of good practice as recommended and established by the Cooling Tower Institute. Under these conditions, the data in Table 1 will permit analyzing test results close enough for practical purposes and to determine whether an expensive formal test and a more detailed analysis will be justified.

Capability vs. Design

Because of variance in design features of cooling towers such as principal dimensions, type, interior arrangement, distribution system, liquid-gas ratios, etc., some variations in performance will occur and therefore allowance must be made against actual test results. When the tower test is conducted within the limits established for the data in Table 1, the maximum amount of error or deviation of the test analysis from specified conditions will be as shown in Table 3.

Tower performance under test conditions may be measured and compared with the specified performance or capacity from the test data, Tables 1 and 2, and the following equations:

Design performance = design g.p.m. × tower test factor × wet-bulb factor.

Test performance = actual g.p.m. × tower test factor × wet-bulb factor.

The departure from specifications is measured by the "performance ratio" which represents the per cent of excess tower capacity or deficiency:

Performance ratio = T.P./D.P.

When test conditions are maintained within reasonably close limits of design conditions, i.e., capacity in gallons per minute, cooling range, heat load, and wet-bulb temperature, a performance ratio greater than one indicates excess tower capacity and a performance ratio less than one indicates tower deficiency.

Test conditions should be established within the following limits in order to

TABLE 2—WET-BULB FACTORS

Wet-bulb temperature during test—	Approach to design wet bulb		
	6° to 8° F.	9° to 11° F.	12° to 16° F.
Design +3°	0.890	0.905	0.911
Design +2°	0.925	0.935	0.939
Design +1°	0.961	0.965	0.969
Design temperature	1.000	1.000	1.000
Design −1°	1.040	1.037	1.034
Design −2°	1.082	1.075	1.070
Design −3°	1.124	1.115	1.109

TABLE 3—PREDICTED ACCURACY LIMITATIONS OF TEST FACTORS IN TABLES 1 AND 2

Maximum variation test versus design conditions			Maximum error in per cent of tower design conditions		
Water capacity (g.p.m.)	Heat load (B.t.u.)	Wet-bulb temp. (°F.)	Range 12°-17° F. Approach 14°-16° F. Range 30°-35° F. Approach 6°-8° F.	Range 12°-17° F. Approach 6°-8° F. Range 30°-35° F. Approach 14°-16° F.	Range 18°-29° F. Approach 9°-13° F.
5%	5%	0	1.0	0.75	0.5
10	10	0	2.0	1.5	1.0
5	5	1	2.5	2.0	1.5
10	10	1	3.5	3.0	2.5
5	5	2	3.5	3.0	2.5
10	10	2	4.5	4.0	3.5
5	5	3	4.5	4.0	3.5
10	10	3	5.5	5.0	4.5

provide data for reasonably close analysis of actual tower performance:

1. G.p.m. of water, ±10 per cent of design.
2. Cooling range, ±10 per cent of design.
3. Range variation during test, ±5 per cent.
4. Constant g.p.m. during test.
5. Average wind not to exceed 7 m.p.h.
6. Wet bulb, as limited in Table 2, trend during test 2° F.
7. Water solids, below 5,000 p.p.m.
8. Fan horsepower, as specified in contract.

Example

Design conditions:

Water quantity—10,000 g.p.m.
Hot-water temperature—105° F.
Cold-water temperature—85° F. (cooling range = 20° F.).
Wet-bulb temperature—75° F. (approach = 10° F.).

Test conditions:

Water quantity—10,250 g.p.m.
Hot-water temperature—103° F.
Cold-water temperature—84.5° F. (cooling range = 18.5° F.).
Wet-bulb temperature—72° F. (approach = 12.5° F.).

Solution

Test range = 18.5/20 = 92.5 per cent of design range.

Test approach = 12.5/10 = 125.0 per cent of design approach.

Design performance = 10,000 g.p.m. × 1.000 T.T. factor × 1.000 W.B. factor = 10,000.

Test performance = 10,250 g.p.m. × 0.776 T.T. factor × 1.115 W.B. factor = 8,868.

Performance ratio

$$= \frac{\text{8,868 T.P.}}{\text{10,000 D.P.}} = 0.8868.$$

The tower is therefore more than 11 per cent deficient in performance, and hence 12.8 per cent more tower capability would be required to meet specified or design performance. Referring to the last column of Table 3, for test conditions in the above example the error would not exceed 3.5 per cent.

Testing a Cooling Tower

In order to obtain satisfactory and reliable results from the tower test factors given in Tables 1 and 2, it is necessary to obtain accurate test information on the tower. Tests should be made in accordance with the Cooling Tower Institute Test Procedure Form No. TSC-101 or the current A.S.M.E. Power Test Code for "Atmospheric Water-Cooling Equipment."

Before starting a test, tower operating conditions should be adjusted to approximate design conditions insofar as is practicable. Tests should be made during the daylight hours, fair weather, and with the tower in operation at test conditions for sufficient time prior to start, to assure stable conditions. The most important data to be obtained during a tower test are the measurement of water quantity, ambient wet-bulb temperature of air entering the tower, and water temperatures to and from the tower. Other test suggestions and precautions follow:

Tower preparations . . . Prior to testing, the tower should be inspected to determine that the distribution system is clean and that the flow of water is equally distributed over the tower cells. The wood splash bars should be free of algae and other foreign materials. Fan horsepower should be checked for agreement with contract requirements. Eliminators and air-inlet louvers should be in original condition so as to permit even and uniform air distribution through the tower.

Water measurement . . . The water flowing to the cooling tower may be measured by any one of the various methods approved by A.S.M.E. power test codes. These may include a pitot-tube traverse, a venturi-meter installation, or the use of an orifice plate. The pitot tube provides an easy method of measurement since it can be equipped with packing glands and inserted through a small gate valve. The tube connections or valve should be installed in a line as far as possible from any fittings or turns. Guarantees are based upon water flow to the tower, so that blowdown and the addition of makeup water during test should be avoided.

"Man! Are you mad? Pipe as scarce as it is and you reminding him of it by smoking that thing!"

Water-temperature measurements . . . (a) Hot water: The hot-water temperatures should be measured as near the tower inlet as possible by either direct contact or from thermometer wells. Hot-water temperature is usually uniform and free from rapid fluctuations; however, careful checks should be made to determine if stratification of water exists.

(b) Cold water: Stratification is frequently present in the cold-water collecting basin hence thorough mixing of the water ahead of the point of measurement is necessary to assure accurate temperature readings. If the circulating pump is located near the tower, temperatures may be measured at the pump discharge since the pump usually provides adequate mixing of the water. The heat added by the pump is normally negligible. Standard mercury-filled thermometers graduated in 1/5° F. are preferable.

Wet-bulb-temperature measurement . . . Ambient wet-bulb temperature of the air should be measured on opposite sides of the tower at the air inlet and at a point not more than 6 ft. above the basin curb and within 10 ft. of the air inlets. Temperature readings should be taken at a minimum of three points on each side of the tower. Wet-bulb temperatures are measured by a sling psychrometer using water from the tower to wet the thermometer readings.

Operating conditions should be stabilized as much as possible, prior to the test. The heat load on the unit and the water circulating rate should be held constant during a test run. A constant cooling range is usually an excellent indication that stable conditions have been obtained. Readings should be taken as frequently as possible, consistent with the number of observers available and the size of the installation. Intervals between readings may vary from 5 to 15 minutes. Accuracy depends more upon the readings being constant than on the length of time devoted to a test run. A series of readings should be taken from which a satisfactory average may be selected for performance test analysis. Test runs so selected consist of at least three successive readings that indicate stable conditions preceded and followed by readings showing no significant trend.

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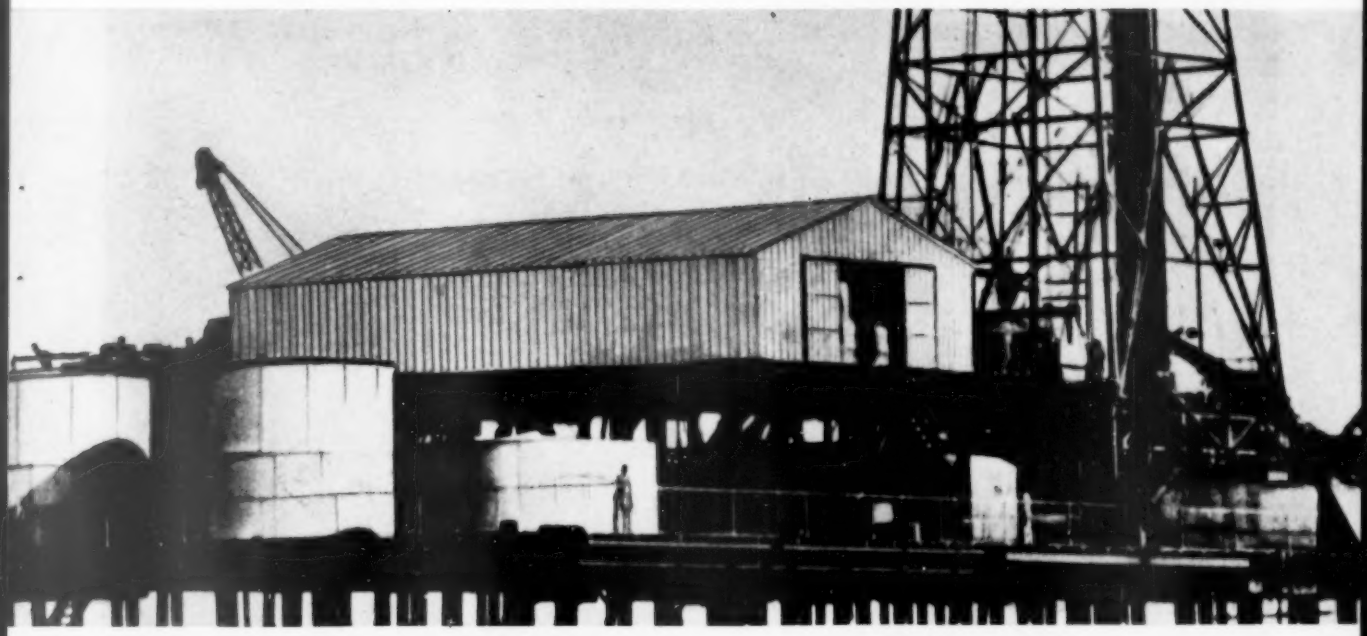

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What Industry Expects Of the Technical Man . . .

• Congenial • Cooperative • Good Judgment • Open Minded • Inquisitive • Neat • Sound Training

by L. G. Weeks

THE current seller's market in technical graduates surely is well known. As far as I can tell, nobody foresees the bottom falling out of that particular market very soon.

While this may be comforting from the individual's viewpoint, it is not difficult to see how a long continuance of such conditions might lead to lowered standards. Competition among individuals, as in business, is a stimulant to progress. Of course, in a healthy, free economy any state of unbalance cannot continue for long, as it sooner or later creates its own remedy.

What industry can give its employes depends primarily on what the employes, through their efforts, make of industry. This is true because, from the employes alone comes the vitalizing force, the yeast that gives life and energy to such inert ingredients as capital and raw materials, and determines the amount and kind of benefits that can flow to all concerned.

That which the oil industry (which I think is a pretty good sample of all industry) requires of a technical man depends perhaps 10 per cent on his scientific and technical knowledge and 90 per cent on other qualifications. It is with the latter that I feel we should deal first.

I recall talking to a very good friend of mine who has long been a teacher of geology at one of our universities and a trainer of men and women in both classroom and field. I asked him to tell me what, in his experience, industry was most concerned with in looking for new employes. Without a moment's hesitation he replied: **"Industry's interest, as evidenced by their questions, runs about in this order:**

"1. Is he a fellow that you would like to have around with you?

"2. Is he reliable?

"3. Has he good judgment and is he independent in his thinking?

"4. How well trained is he?"

Very much along the same line, a head of an oil-company exploration department replied as follows to the same question:

"What I expect a new employe to be, in order of preference, is:

"1. Cooperative. Willing and ready to do what is asked of him.

"2. Open minded. Alert to listen to, and take advice from, his superiors, and to give full consideration to all others.

"3. Congenial. Able to get along with his fellow employes, but without lowering his own moral standards.

"4. Inquisitive. Keen desire to know the reason for things and to look beyond what is required.

"5. Neat, both physically and mentally."

Though he did not mention it, we may safely assume that he would include also a basically sound knowledge of his profession.

Let us consider some of these points, though not necessarily in the form and order listed.

Industry expects to have technical men who can create or help create public confidence.

When everybody's thoughts about a company or industry—their expectations and their fears, their good opinions and their bad—are added up, they represent what can be boiled down into two words: "public confidence."

Ability to create and hold public confidence is a highly practical qualification. One of the primary aims of an enterprise obviously is to stay in business. Another is to prosper from its efforts. If the company is to do both of these things, it must so conduct its affairs as to **deserve** the confidence of people. Then it must go on to **secure** the confidence. Finally, having deserved and secured it, the company must **hold** the public's confidence.

By "people," or "public," let's not think of a nebulous sort of mass. Let's think in terms of real persons—customers, shareholders, dealers, housewives, educators, and—may I add, students.

The company I am associated with is one of the many that makes a conscious effort to cultivate the understanding of college and university students. It wants their favorable opinion. They are among its customers of the future. They are among its neighbors in the areas in which it operates. It hopes they will be among its friends.

Industry expects a technical man to have a sense of responsibility to his community.

People used to think about an industry's effects on a community largely in material terms, how many jobs it offered, how it paid its employes, and sometimes whether it dumped its waste in nearby streams and lakes, or disposed of it so as not to injure or annoy anybody. A company's payrolls, and their bearing on the local merchants and the upkeep of the local streets and schools and other facilities and institutions, are indeed matters of concern.

In the pollution field, industry now is tackling the question of air pollution, in contrast with the old problem of contaminated streams. But industry is also recognizing an obligation to contribute to other phases of the community's life. A company establishes an appropriate relationship with charitable, welfare and other civic endeavors more or less as a matter of course. I would say that employes should join, in the towns they live in, the churches, and various organizations of social, civic and other kinds. However, in addition, it expects part of the burden of local leadership, such as work with school boards, governing bodies, civic improvement projects and

The author is a geologist with Standard Oil Co. (N. J.). Paper presented at annual engineering conference, Virginia Polytechnic Institute Association for the Advancement of Engineering.

the like, to be taken on by its employes.

Community affairs involve decisions which call for both the precision thinking that a technical education helps to develop, and the broad social, political, and economic understanding that companies expect in their technical men. The wisdom with which community decisions are made goes far toward determining the social climate in which the enterprise operates. That, in turn, has a great deal to do with determining whether, and how long, the company is to achieve its primary aims of continuing in business.

Industry expects a technical man to have a strong moral sense.

Any company can train employes in any number of skills. But a fellow's moral backbone is in a different classification. It isn't something you can just pick up as you go along. You had better bring it with you to the job. I think that by the time you have completed your academic study, you've either got it, or should give first place to acquiring it.

If the technical man thinks of morality partly in terms of religious feeling, so much to the good. There is no conflict between such feelings and achievement in an undertaking with such highly materialistic objectives as the production of goods for profit and a balance sheet that commands respect. The notion that the material and the spiritual are irreconcilable, that they are mortal enemies arrayed on opposite sides of a great barrier, is a myth. And while this institution may not offer courses under the specific heading of the brotherhood of man, I doubt that any student can fulfill the requirements here without coming into possession of a wholesome regard for the spiritual in mankind.

Industry more and more expects its employes to fit into the life of the foreign countries in which it may operate.

Some industries which employ many technical men—and this is particularly true of the oil industry—are becoming more and more rapidly concerned with human nature in many different countries. Every one of these countries presents some situation peculiar to itself. Questions of language, religion, education, politics, the employe's family, government, tradition, superstition—all may have extremely important bearings on the success of an enterprise which is trying to establish itself in a remote area.

An employe is expected to learn the language of the country to which he is assigned. To that end, the company conducts classes in the language. Above all, the religion of the country must be respected. In Arabia, the company's Moslem employes erect mosques at company expense for their own use, and the company provides time and opportunity for daily worship, whatever the time of day and wherever the job. Education is fostered.

Industry needs employes who are truly interested in peoples, who know how to understand them and gain their respect. Only in that way can they work with them to the benefit of all. Industry needs men with faith and optimism, rather than distrust and pessimism. It needs people with a sense of social consciousness and human understanding.

Industry expects a technical man to have ambition.

Even though ambition was blamed for unhappy results in the case of Julius Caesar, it is by and large an excellent quality. We owe a tremendous debt to human ambition. It is the prime mover. The progress which this country makes from today onward, and the good things in life which countless people will enjoy, will be the fruit of the will to do things of courage to take risks, and confidence in one's own ability.

These qualities are of utmost importance in the world of the chemist, the engineer, the architect, the geologist, and the manufacturer. The frontier of technological progress isn't even in sight, and it won't be in our time. The door of opportunity for the technical man is as wide open today as the geographical world was for the explorer and settler in the era of the sailing ship and the covered wagon.

While industry expects the technical man to have courage and patience, it also wants him to make the most of his opportunities.

Do not let your ambition lead you to discouragement. If you are an engineer, your first job will not be to build a new bridge across the Hudson. You will first have to demonstrate your capacity in many lines, not the least of which is the ability to cooperate and to handle men. So do not be disappointed if your first job is to build the tool shed, or perhaps just to help draw up the plans or rustle the materials.

If you take a job as a junior geologist for an oil company you may spend your first 2 or 3 years attached to a field party assisting the geologist in field and office mapping. Again, your first job may be catching and logging samples on a wildcat rig; or, you may be engaged in compiling and plotting subsurface data. In all of this, you will acquire a lot of new knowledge. But the development of wisdom is a slower, less certain process. Here, much more depends on the individual—his inquisitiveness, his capacity, and willingness, but particularly on his sense of balance and judgment. **Knowledge is not wisdom. Neither is experience. Wisdom is the capacity for insight and judgment. It can, but not necessarily always does, flow from knowledge and experience.**

Consider opportunity ahead of security and you will usually find that security will then take care of itself. One of my firmest beliefs is, if all Americans observed this simple principle there would be a vast improvement in our national morale, and particularly in our soundness as a nation. Someone has very aptly said that "each man should cut a niche for himself—not chisel it."

Industry expects the technical man to be cooperative.

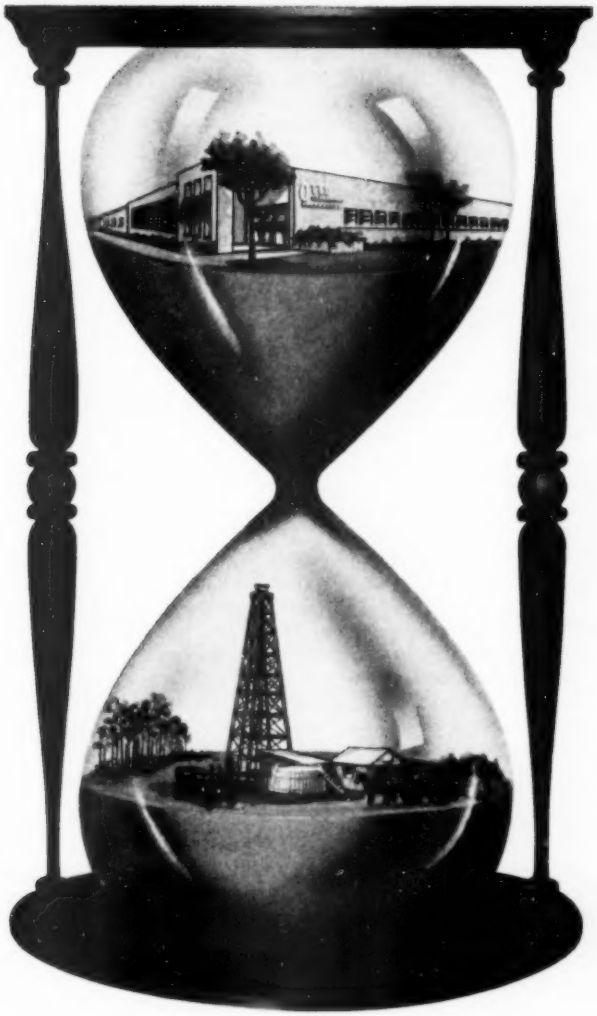
In industry today, perhaps more than ever before, the individual is judged by his capacity to be a good team worker. Today, more and more, industrial operations require a variety of special skills. This is particularly true in such complex businesses as the petroleum industry.

Even in a single branch of a business, such as, say, oil exploration, we often have to deal with problems involving a variety of expert talent. It is not uncommon to call on the advice of three or four or even all of the following: geologists, geophysicists, lawyers, landmen, economists, accountants, engineers, and experts in drilling operations. Certain types of problems or plans may require the assistance of still other talent, such as pipe-line experts, etc., for a sound decision.

This means that there is a considerable amount of committee work in modern business. But whether in committee or in following out your routine special tasks there is always the need for sincere and enthusiastic cooperation.

The man who cannot work well with his associates may be a less valuable employe. It is just as important to you that you know how to get the other fellow to sympathize with your viewpoint as it is that you give consideration to his. Working as a team, you will find, in most all cases, accomplishes more than working alone.

No matter how much you know you



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can always learn something from another viewpoint. Will Rogers once said, "Everybody is smart. They are just all smart in different ways." In the oil business you will find that you can sometimes get a lot of real sound information from a man like a driller or a refinery hand, who may never have gone to college.

Industry expects the technical man to have a thorough grounding in the fundamentals.

It is much more important that you spend your time in college learning the basic fundamentals of your science than in trying to master the industrial applications or the methods of using basic knowledge. No college can keep up with all of the advances in the application of basic knowledge in industry. No industry expects a young technical employe to know all about these methods. They are not difficult to learn and the employer expects to have to train a new man.

Industry expects the young technical man to have a good basic understanding of his science.

A man well equipped with fund..mental knowledge will be of much more real value to his employer than one with a smattering of such training and a lot of so-called methodology that does not require a college education to learn and may be quite out of date.

Colleges are going much further today in their teaching than did those of my day. Not only is each subject taught better, but they have added more of the basic subjects and greatly improved the methods of teaching.

The addition of requirements means that many students are finding it necessary to add one or more years to their college training. This need for extra training is increasingly recognized by industry, for today it is becoming more and more general to give preference to men with master's degrees.

Industry expects that its young technical employes have been trained to think.

Perhaps the most important thing that an education should give one is the ability to think—to think critically, analytically, and constructively. A properly maturing mind should develop a healthy skepticism and a spirit of intelligent inquiry. That is the kind of mind industry needs to give its business a dynamic and flexible nature, and on which it can depend for maintenance and improvement of its organization and methods. That is what a business needs if it is to progress. There is no security for business, any more than there is for the individual or for society or the nation, in a status quo.

A trained mind, one that is trained to think and to judge, is the mark of the educated man. So be able to show your employer a college degree of intellectual competence rather than merely one of credit hours.

Of great value is the ability of expression.

There is a Chinese proverb which says that "He who knows and cannot say is just as if he did not know." There is also a great deal in knowing **what** to say.

Say what you want to say in simple terms. You are not being paid to turn out something for others to puzzle over. When you get so all wound up in big words that you have difficulty in completing your sentence, just stop and ask yourself: "What is it that I want to say?" And if you really know your subject, you will answer yourself in a few simple words. Then, ask yourself this second question: "Why don't I say so?" Then go ahead and say it just as simply. Or, if you are writing, write it as you would say it, in the simplest, clearest terms possible.

Be ready to correct your mistakes.

There is no disgrace is being wrong—so long as you change your opinion when you find out you've made a mistake. Experimental work is nine-tenths of matter of discarding. Some of the greatest discoveries of history have come in the search for something else.

Lack of success need not be failure.

A turtle is smart enough to know he can't make progress unless he sticks his neck out. But he also knows enough to pull it in when he finds he has guessed wrong.

I might add, however, that sticking one's neck out just to make an impression isn't generally the best way to get ahead. Industry isn't as likely to honor one who does that as someone who works diligently and honestly. It is well to have pride in your work. It is equally important that others have pride in it too. Technical work is more blood, sweat, and tears than some people think.

Be aware that others make mistakes also.

Have a mind of your own and do your own thinking. The other fellow is not always right.

Do not be blinded by the other fellow's brilliance.

Da Vinci, Darwin, Edison, and Marconi had their predecessors in science, even in most of the things that they are credited with inventing or creating.

Some of the greatest successes have come from the lower third in scholastic standing. Charles Kettering, who was vice president and head of research for General Motors, is your authority for the fact that the man with less "book learning" often works out more satisfactorily than the one with the highest standing. The latter, Kettering said, will give one all sorts of reasons why a thing just cannot be done. The former doesn't know that it cannot possibly be accomplished, so he goes ahead and does it.

We develop by doing. That is why so many of our great men rose from the ranks of the humble. Their early struggle developed in them a priceless quality and capacity. Those whose circumstances have brought them to man's estate without struggle are to be pitied rather than envied, for they have missed many chances for development. Those who achieve great things despite the fact that they did not experience adversity are also to be congratulated, for theirs may have been the greater handicap. The truly best things in life are never free, but they are worth working for.

A company executive one day was speaking to employes on making the most of their opportunities. He held up a large sheet of paper. At the center he had placed a black dot. He asked each employe what he saw, and each promptly replied, "A black dot." The executive then said, "Yes, there is a little black dot, but none of you saw the big sheet of white paper. That is the real point of my story."

The real point of **my** story is that industry the world over needs technical men, more than it can get. The reason is that people the world over want more and more of the good things in life, faster than industry can devise them or turn them out. The technical man who is soon to take his place in industry has a wonderful opportunity to make a place for himself.

BOOK

ABC's OF OIL. By Jerry Robertson. Published by Petroleum Publishers, 118 Northwest First Street, Evansville, Ind. 86 pp. $2.

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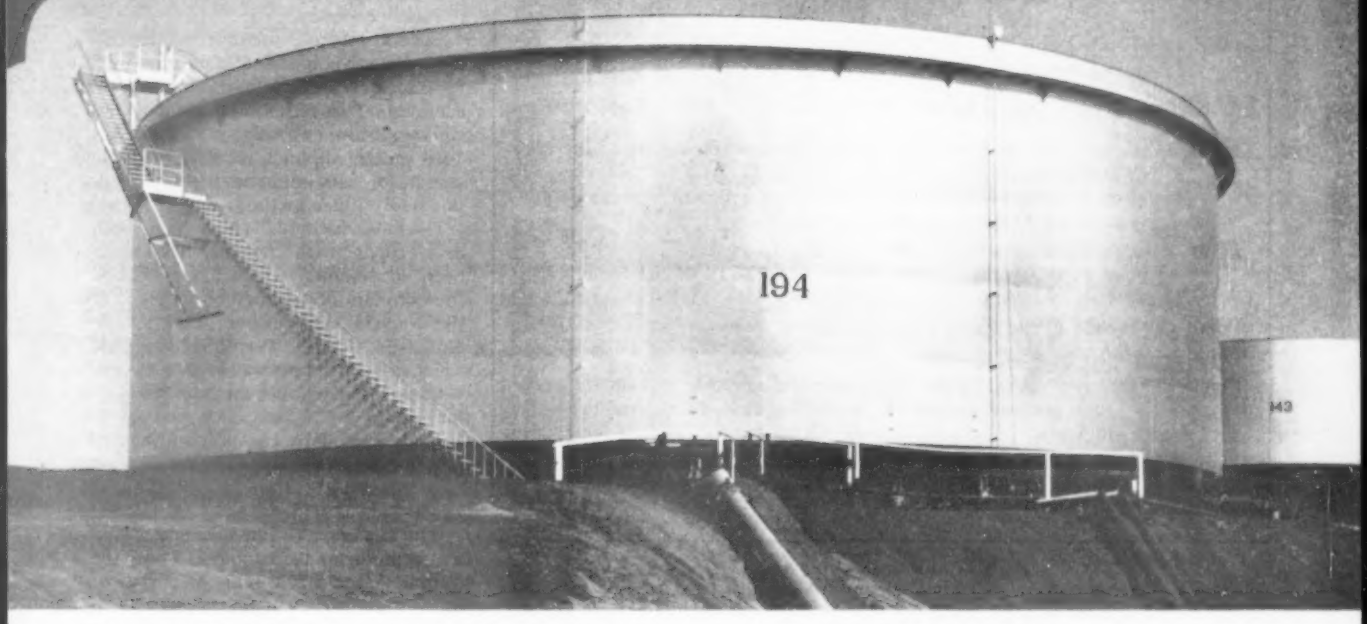

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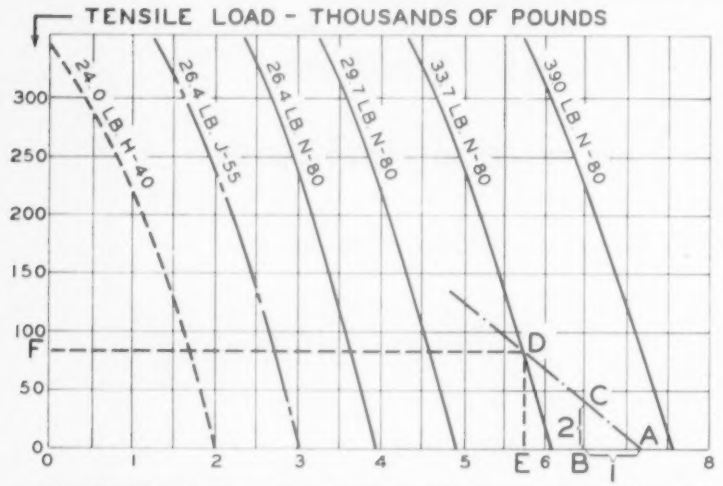
TRIANGULATION METHOD

. . . for determining collapse change points in casing design

by R. L. Kastor



Point A—Hydrostatic pressure of the drilling fluid at the bottom of the casing string.

Leg 1—Magnitude of the reduction in hydrostatic pressure due to a 1,000-ft. rise in hole.

Point B—Hydrostatic pressure 1,000 ft. above Point A.

Leg 2—Magnitude of the weight of 1,000 ft. of the bottom section of casing.

Point C—Weight of the 1,000 ft. of casing.

Point D—Collapse change point.

Point E—Collapse change depth in hydrostatic pressure (divide by pressure gradient in psi./ft. of drilling fluid to determine depth in feet).

Point F—Total weight of casing suspended below change point (useful as check).

Fig. 1—Construction of the triangle.

The need for a faster technique of designing casing strings for collapse resistance has been answered by the triangulation method now developed. It is a graphical solution that is consistent with conventional methods to locate collapse change points and is simple enough to be used by relatively inexperienced personnel.

THE adoption of combination weight casing strings soon introduced the problem of determining collapse change points in casing strings. This problem stems from the accepted theory of failure by yielding which indicates the resistance of a tube to collapse is reduced by tensile stress.

Author with Shell Oil Co., New Orleans. Presented at Petroleum Mechanical Conference, A.S.M.E., Houston, September 28, 1953.

The determination of the change points is illusive because the collapse resistance of a particular casing is dependent upon tensile stress. Since the collapsing pressure is also a variable with depth, the problem resolves to determining a particular depth at which the collapse resistance, including the allowance of a suitable safety factor, is equal to the collapsing pressure. The collapse resistance is an elliptical function making the solution mathematically rather complex.

Several methods for determining collapse change points have been proposed. As indicated previously, the mathematical method is complex and time consuming. More recently a method has been presented which requires a special chart[1] for solution, and there are undoubtedly other methods in use.

Of those methods which have been investigated, some difficulty has always been encountered which has prevented the adoption of the method in place of the conventional, time-consuming trial-and-error method. Therefore, the need for a faster technique adaptable to conventional calculation methods has remained.

Such a method has been developed and is now presented.

Triangulation Method

The triangulation method is a graphical solution to the problem. The basic tools required are a chart of curves of the variation of collapse resistance with tensile load, such as Fig. 1, and are available in almost any casing manufacturer's engineering data book.

Briefly, the problem resolves to determining the intersection of two curves, one of which varies linearly, while the other approximates a portion of an ellipse. The linear curve relates the variation of hydrostatic pressure with hanging load, while the elliptical curve relates the variation of collapse resistance with hanging load.

The technique is based upon the fact that both of the curves vary with the same physical parameters — pressure and weight.

By plotting a linear curve of the variation of hydrostatic pressure with hanging load on the same chart with

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First

. . . in selecting the steel to be used in a Drill Collar, chemical specifications alone are not enough!

For example, simply specifying that a Drill Collar be made of a certain AISI specification steel—or any emergency substitute—permits far too great a variance of alloys to obtain uniform physical properties in the finished product.

Alloys that produce uniform properties when used in small cross-sections produce entirely different sub-surface properties when used in a thick-walled Drill Collar. Therefore, the steel used in Drill Collars should be selected by the "hardening characteristics" as well as by chemical specification.

Baash-Ross does this by checking the "End Quench Hardenability" index of each individual heat of specified steel to determine exact hardening characteristics. Then, based on this test, each heat of steel is separately classified as to the size of product cross section that particular steel is to be made into to secure the desired uniform physical properties in the finished product.

Thus, Baash-Ross assures each Drill Collar having accurately-controlled sub-surface as well as surface physical properties. Repeated re-cuts can be made on the threaded ends without sacrificing thread strength or hardness!

Second

. . . specifying that the Drill Collar should be heat-treated to a certain hardness is not enough!

The really important thing is how the Drill Collar is processed—how it is heat-treated to develop its best physical properties.

Through years of experience, Baash-Ross has learned that these processing steps are quite critical and must be accurately controlled to produce a Drill Collar free of structural defects and residual stresses. First, the bar is normalized and tempered over its entire length in one operation to produce a stress-free homogeneous structure with the desired physical properties.

After the bar has been machined to the specified outside and inside dimensions, each end of the Drill Collar is again treated by an oil quench and tempering operations to produce the required uniform physical properties necessary for the threaded end zones.

Thus, a Drill Collar is produced that is free from residual stress to assure sustained straightness—with high impact values to resist shock loading—and with the end zones of such uniform physical qualities as to permit repeated recutting without reduction of original joint strength!

Third

. . . specifying the size and type of joint desired on the Drill Collar is not enough!

Almost any machine shop can cut joints that will reflect proper gage standoff and will thread together. But the important thing is whether the joint is machined to obtain its full designed efficiency. Joints that are not produced with accurate thread form, lead and taper will permit wobble and cause failure. Furthermore, joint alignment in Drill Collars is particularly important because the rigidity of these members concentrates mis-alignment stresses on the threaded connections and is the most common cause of joint failure in Drill Collars.

Baash-Ross asures accurate thread form, lead and taper in every joint by a prescribed method of checking and gaging that goes far beyond standard gaging standoff tests. Then the alignment of every joint is precisely checked with a Baash-Ross Alignoscope* to assure its not varying by more than 1/10 of 1% of theoretically perfect with respect to the longitudinal axis of the Drill Collar—virtually perfect alignment!

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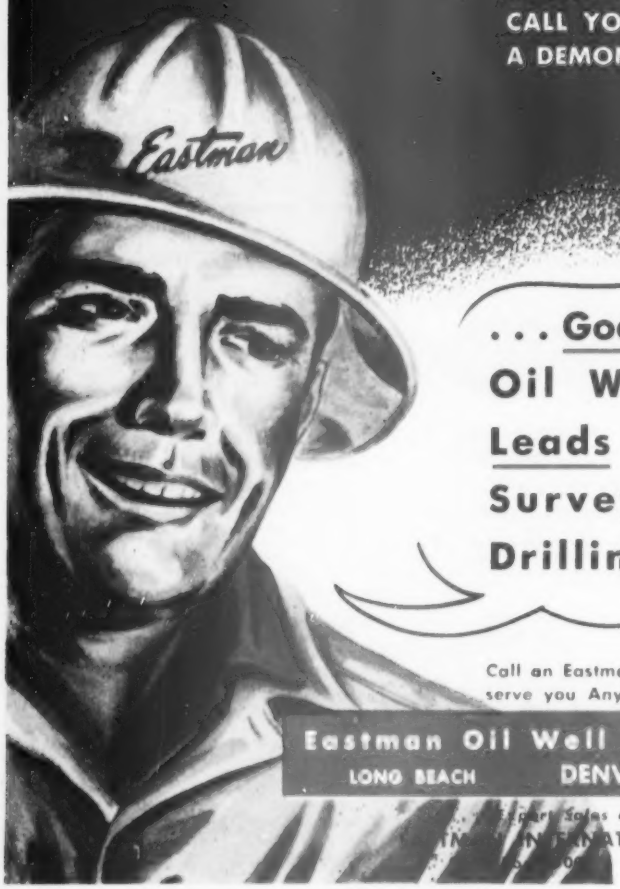

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the curves of the variation of collapse resistance with tensile load, the collapse points may be determined from the intersection of the two curves. The problem, of course, is to determine the intercept and slope of this linear curve.

Construction of the triangle . . . The intercept of the linear curve with the pressure axis is readily determined since the hanging load is zero at the bottom of the string and the hydrostatic pressure equals the drilling fluid pressure gradient times the depth.

The slope of the linear curve depends on the weight of drilling fluid in the hole and the weight per foot of the casing below the change point being determined. Therefore, the slope may be established by determining and plotting the magnitude of the perpendicular legs of a right triangle and connecting the extreme ends of those legs.

The magnitude of the horizontal leg is taken equal to the decrease in hydrostatic pressure in a 1,000-ft. rise in the hole. The leg is plotted from the intercept point described above.

The magnitude of the vertical leg is taken equal to the weight of 1,000 ft. of weight casing in the string immediately below the change point being determined. This leg is plotted from the opposite end of the previously designated leg of the triangle.

By connecting the extreme ends of these legs, the slope of the linear curve applicable to that particular section of the string is established. The intersection of the linear and elliptical curves defines the change point in terms of hanging load and hydrostatic pressure. The depth in feet may easily be determined by dividing the hydrostatic pressure by the pressure gradient of the drilling fluid.

A Design Example

The technique may be most readily illustrated by the use of a design example. Since this example is to illustrate only the method of designing for collapse, the upper portion of the string, which is controlled by tension and burst, will not be considered.

Assume it is necessary to design an 11,000-ft., 7⅝-in. protective casing string to set in 12.5-lb. per gallon drilling fluid maintaining a minimum conventional collapse safety factor of 1.00.

It is possible to apply any collapse safety factor by using an equivalent mud weight determined as the product of the actual mud weight and the desired safety factor for collapse.

The hydrostatic collapsing pressure at the bottom of the hole is, therefore, 11,000 ft. × .650 psi./ft. or 7,150 psi., assuming zero internal pressure.

From A.P.I. minimum values, it is found that 39.0 lb./ft. N-80 casing having a tabulated collapse resistance of 7,530 psi. is required at 11,000 ft.

The resulting collapse safety factor is 7,530 divided by 7,150 or 1.05.

To determine the depth at which 33.7 lb./ft. N-80 will set with a collapse safety factor of 1.0 by the triangulation method, proceed as follows:

1. Establish Point A, the collapse pressure at 11,000 ft. at zero tensile load.

Abscissa = 7,150 psi.
Ordinate = 0 lb.

2. Establish Point B, the collapse pressure at 10,000 ft. (or 1,000 ft. up the hole).

Abscissa = 7,150 − 650 = 6,500 psi.
Ordinate = 0 lb.

3. Establish Point C, the tensile load hanging below the 10,000-ft. depth (or 1,000 ft. up the hole).

Abscissa = 6,500 psi.
Ordinate = 1,000 (39.0) = 39,000 lb.

4. Connect Points A and C with a straight line and extend the line, if necessary, to intersect the collapse resistance curve for 33.7 lb./ft., N-80 casing at Point D.

5. Read the coordinates of Point D.

Abscissa = 5,730 psi.
Ordinate = 85,000 lb.

6. Convert the abscissa of Point D to feet by dividing by the drilling fluid pressure gradient.

5,730 psi. divided by .650 psi./ft.
= 8,820 ft.

This is the depth at which 33.7-lb./ft. N-80 casing will set with a collapse safety factor of 1.00, including the effect of tension on collapse.

7. Check the solution by determining the weight of 39.0-lb. casing hanging below 8,820 ft.

11,000 ft. − 8,820 ft. = 2,180 ft.
2,180 ft. × (39.0 lb./ft.) = 85,000 lb.

Thus the solution checks with the ordinate of Point D.

Second change point . . . To determine the depth at which 29.7 lb./ft. N-80 will set with a collapse safety factor of 1.0 by the triangulation method proceed as follows:

1. Establish Point A′ equal Point D

Abscissa = 5,730 psi.
Ordinate = 85,000 lb.

2. Establish Point B′, the collapsing pressure at 7,820 ft. (or 1,000 ft. above the first change point)

Abscissa = 5,730 − 650 = 5,080 psi.
Ordinate = 85,000 lb.

3. Establish Point C′, the total tensile load hanging below the 7,820-ft. depth (1,000 ft. up from Point D)

Abscissa = 5,080 psi.
Ordinate = 85,000 + 1,000 (33.7)
= 118,700 lb.

4. Connect Points A′ (D) and C′ and extend the line to intersect the 29.7 lb./ft. N-80 curve at Point D′.

5. Read the coordinates of Point D′.

Abscissa = 4,270 psi.
Ordinate = 160,800 lb.

6. Convert the abscissa of Point D′ to feet.

4,270 psi. divided by .650 psi./ft.
= 6,570 ft.

This is the depth at which 29.7-lb./ft. N-80 casing will set under the above conditions.

7. Check the solution by determining the total weight of the casing hanging below the 6,570-ft. depth.

8,820 ft. − 6,570 ft. = 2,250 ft.

2,250 ft. (33.7 lb./ft.) = 75,800 lb.

85,000 + 75,800 = 160,800 lb.

Thus, the solution checks.

The above-described procedure would then be repeated until no further collapse change points need be determined. In the example, this would probably occur with the change to 26.4 lb./ft. N-80 since the use of 26.4-lb./ft. J-55 casing would probably be precluded by tensile or burst requirements.

The method may be used when it is necessary to transfer from one chart to another by relocating the last used Point D, relabeling it Point A, and establishing the related points B and C on the new chart.

Acknowledgment

The author wishes to extend his appreciation to W. R. Cox who suggested the technique for incorporating safety factors other than 1.0 and to his colleagues in the mechanical engineering section for their valuable assistance. Appreciation is also extended to the Spang-Chalfant Division of National Supply Co. for permission to reproduce material and to the management of Shell Oil Co. for permission to publish this paper.

Reference

1. "Casing Diagram Design Charts," Youngstown Sheet & Tube Co., Booklet No. 60, pp. B-30.

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Trifuel Pipe-Line Engines Demonstrate Operating and Economic Advantages

Here is the experience of a large company with a group of four-cycle diesel engines capable of burning diesel oil, natural gas with pilot oil, or, with minor conversions, capable of operating on natural gas with spark ignition.

by L. P. Meade and C. P. Jennings

COMPARATIVE operating costs for trifuel, dual-fuel, and diesel engines used on pipe-line pumping applications show for an average load of 1,000 hp. that:

1. Use of trifuel engine results in savings of more than $2,000 per year over the dual-fuel engine.

2. Use of the trifuel engine results in savings of more than $30,000 per year over the straight diesel engine.

The dual-fuel engine is designed to operate either on diesel fuel alone or on natural gas with diesel fuel. The trifuel engine can in addition operate on natural gas alone.

Borger-Chicago Products Pipe-Line Engines

The first group of engines purchased for the Borger-Chicago Products Pipe Line were of eight-cylinder design and originally equipped for 1,200-hp. operation with low-pressure supercharging on dual-fuel operation. It was contemplated that they would later be converted to trifuel engines; however, at the time of purchase of these engines, most of the trifuel engines available used a high-voltage ignition system with a high-voltage distributor. Experience in the industry had shown that the spark-plug life to be expected with this type of ignition system was limited to approximately 2,000 hours.

The manufacturer of the engines proposed withholding the spark-ignition system from the engines at the time they were delivered, to allow perfection of a new ignition system which would employ a 24-volt impulse generator with a low-voltage distribution system and a transformer at each cylinder. Since the manufacturer was able to show evidence of successful development work along this line, the first engines which were delivered on this products pipe line were installed for dual-fuel operation only, and were to be converted to spark ignition at a later date.

Authors are associated with Phillips Pipe Line Co. Presented at the eighth national conference, Petroleum Mechanical Engineering Division of A.S.M.E., Houston, September 28-30.

New ignition system . . . By the time the manufacturer was ready to install the new ignition system, Phillips Pipe Line Co. had need for additional horsepower and wished to consider additional supercharging of the engines. In supercharging straight gas engines, the increase in inlet pressure required to obtain high brake mean effective pressure (b.m.e.p.), coupled with high-compression characteristics of the diesel cycle, produces a tendency for uncontrolled burning and detonation in the cylinders which prevent the engines from operating smoothly. If allowed to continue, could cause excessive exhaust temperatures and engine failures.

It is for this reason that spark-ignition gas engines are normally restricted to lower b.m.e.p. It is significant that the real trouble does not lie in the high b.m.e.p. but in the high temperatures and uncontrolled burning which accompany it. Various engine manufacturers have developed different methods for controlling combustion temperature in an effort to raise their allowable b.m.e.p. Their designs have included air coolers and, in some cases, refrigeration of the combustion air both before and after supercharging, increased water jacket cooling, changes in cycle characteristics, etc.

The particular engines purchased by Phillips Pipe Line Co. were designed to allow them to be converted to use a cycle or system which operates with a low compression ratio and high expansion ratio. This system consists in changing the air inlet valve closing from bottom dead center to a position of from 40° to 80° before bottom dead center. This allows the air (and gas when the engine is operating on gas fuel) to expand in the cylinder from the time the valve is closed until bottom dead center, thus producing a marked cooling of the air-gas charge in the cylinder which results in lower compression and cycle temperature and pressure.

In order to get sufficient air into the cylinder during the shorter time the valve is opened, the supercharging pressure is increased. Because the air is cooled, no increase in inlet air temperature is experienced. Changes in air requirements caused by load variation for diesel operation are compensated for by changes in supercharging pressure. On full gas operation it is also necessary to vary the closing point of the inlet air valve in order to obtain the theoretical air-gas ratio for smooth

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Fig. 322
Geyser Float Shoe

Fig. 302
Regular Float Shoe

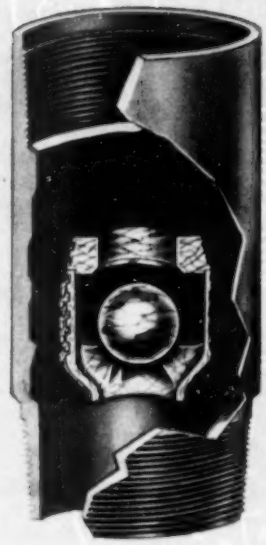

Fig. 401 M & F
Male and Female
Float Collar

Fig. 202
Regular Guide Shoe

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operation and maximum economy. This "built-in" cooling effect, or reduction of net compression ratio, can be applied to naturally aspirated as well as supercharged engines. The former covers a rating of 80 b.m.e.p. and the latter a rating up to 160 b.m.e.p. when supercharged to about 15 psig. and intercooling the supercharged air.

Additional horsepower . . . In order to obtain additional horsepower from the original engines, Phillips Pipe Line Co. decided to convert them to the high-pressure supercharging system with variable inlet-valve timing. The conversion was to be carried out concurrently with the installation of the recently developed impulse generator ignition system. These engines were originally equipped for 1,200-hp. operation with low-pressure (3-psi.) supercharging. With the variable inlet valve timing it was possible to go to 1,600 hp. and 160 b.m.e.p. on straight gas with spark ignition, 1,400 hp. and 140 b.m.e.p. on dual-fuel, and 1,320 hp. with 132 b.m.e.p. on straight diesel.

The b.m.e.p. and resultant horsepower for dual-fuel and straight diesel were limited by the capacity of the superchargers which were originally furnished with the engines for 1,200-hp. operation. Ordinarily the manufacturer would have used a higher-pressure supercharger, but since it had been found by experience that sufficient pressure could be developed with the existing supercharger for operation up to 160 b.m.e.p. on straight gas, it was decided not to spend the money for new superchargers. This is possibly due to the fact that the air-fuel ratio is substantially lower when operating on straight gas fuel.

Operating experience with these engines since conversion has been rather short. Two principal problems have arisen which were not anticipated; one can be attributed to the regulation of the variable inlet-valve timing system and the other to the use of spark ignition at the higher b.m.e.p.

Load changes . . . Pipe-line engines, and especially those on lines handling products of various specific gravities, must be readily responsive to changes in load at varying speed. An attempt was made to regulate the inlet-valve timing manually, but it was found by experience that manual control was not satisfactory. This particular pipe line transports products of from .51 to .75 sp. gr. by slugs. When a light product is in the line, the engine must of necessity run considerably faster for the centrifugal pump to develop a given "pounds" pressure needed to transport the fluid through the pipe line than would be the case with a heavier product; at the same time less horsepower is required at the higher engine speed than at the lower speed, due to the difference in specific gravity of the fluid in the pump and also to its flow characteristics in the pipe line.

This situation requires that a considerable adjustment be made in the inlet-valve timing as an interface (or change in product) goes by the station. When changing from a heavier product to a lighter product, the time of making this adjustment manually by the station operator was not critical since the lack of the adjustment simply resulted in an excess of air causing rough operation of the engine and a slight loss of efficiency. When going from a light product to a heavy product the necessity for anticipating the change and making the adjustment prior to arrival of the interface was critical since failure to do so would starve the engine of air, resulting at times in stalling the engine.

While this situation could perhaps have been taken care of by careful operation, it was desired to have the gas-air inlet system operate as nearly automatically as possible with no reliance having to be placed on the station operator to make such changes. To accomplish this the engine manufacturer is currently placing mechanical actuators on the inlet-valve timing mechanism to automatically control it with respect to load on the engine. It is believed that this will overcome the difficulty.

The second basic problem was the deterioration of the valve seats in the engine heads. The seats, while maintaining a good seal, receded into the head at an excessive rate, requiring frequent tappet adjustments. There has been no indication of burning or damage to the valves. It was felt that this difficulty was caused by seat material being too soft at temperatures resulting from spark-ignited gas operation. It is currently being corrected by the manufacturer.

There have been minor mechanical and electrical difficulties which are not considered of special significance as far as the basic ignition system is concerned though until solved they were a continuing annoyance. Several high-tension transformers were defective and had to be replaced, and one impulse generator has been burned out through failure of the operators to ground the primary before disconnecting the high-tension lead while the engine was operating.

The most annoying failure and the one which has caused the most erratic operation of the engines has been the failure of the insulation on the high-tension lead where it enters the spark-plug assembly. A rubber boot, or cover, was provided to seal this connection from lubricating-oil spray. A connection on this boot failed, allowing oil to seep into the spark-plug extension, resulting in shorting and missing of the cylinder. This is being corrected by the manufacturer.

One point of great concern prior to the purchase of these engines was spark-plug life. The manufacturer expects the plugs with the impulse generation system to give between 5,000 and 10,000 hours of service. Some of the engines now have operated as much as 2,500 hours. There has been no indication of spark-plug fouling or point erosion on any of the engines. Whether the 10,000-hour life expected by the manufacturer will be realized, only time can tell.

Mextex and Crude-Oil Pipe-Line Engines

The second group of trifuel engines was purchased specifically for spark-ignition operation with provisions for conversion to dual-fuel. These engines were of six-cylinder design and were rated at 600 hp. when naturally aspirated, at 900 hp. when supercharged to approximately 3 psig. and equipped with the variable inlet-valve timing system, and at 1,200 hp. when supercharged to approximately 15 psig. and equipped with the variable inlet-valve timing system and with aftercoolers. The engines were all equipped with an impulse generator low-voltage distribution ignition system with individual transformers at each cylinder. They were also equipped with two spark plugs per cylinder.

Eight of these engines to be used on the 8-in. Mextex Gasoline Pipe Line were ordered for naturally aspirated operation with variable inlet-valve timing for 600 hp. Due to the fact that these engines are not yet supercharged, no need for varying the inlet-valve timing has been experienced. As a matter of fact, even though these engines are equipped with variable valve timing, they are being operated with a single valve setting which gives a net compression ratio of about eight.

To control and regulate the air-fuel ratio at lower loads, a butterfly valve controlled by exhaust temperature was placed in the inlet manifold. Since the exhaust temperature does not respond instantly to sudden load changes, an override for this control was provided which is operated by the governor.

The other 10 engines to be used on the Odessa-Borger crude oil pipe line were ordered for low-pressure supercharged operation with variable inlet-valve timing and were equipped with intercoolers. On these engines the air-fuel ratio is controlled manually by varying the valve timing in the same

(Continued on page 150)

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Some Factors in F.C.C. Operation

This second article in a continuing series discusses fluidized bed behavior, particle size, catalyst recovery, heat balance, and pressure balance in the F.C.C. system. These will be taken up in more details in articles to follow

by J. W. Moorman

IN analyzing the fluid catalytic cracking process the system may be divided into four major categories: (1) the fluid bed, (2) heat balance, (3) pressure balance, and (4) catalyst recovery.

1—FLUID BED

Though the phenomenon of the fluid bed has been known for a great many years, its true significance and importance did not come to light until late in the 1930's or early 1940's. The tendency of finely divided powders to develop high concentrations in a low superficial gas-velocity system was indicated in research laboratory work and later confirmed in 1939 through an extensive research program carried out at M.I.T. It was on the basis of this program that the 100-bbl. per day experimental catalytic cracking unit at Baton Rouge was redesigned in the latter part of 1940 to incorporate the basic fluid catalyst principles.

The handling of finely divided powders in high-velocity transport lines has been known for a great many years. This technique had been employed for sand blasting and conveying of many materials. However, such systems should not necessarily be considered as an essential and integral part of the fluidized powder process. Consequently, as a matter of definition, the fluidized technique will be considered here as a system wherein a dense concentration of finely divided powders occurs under low superficial gas velocity conditions.

The author is consulting engineer, Tulsa.

Fluidized Behavior

The fluidized powder technique involves suspending the finely divided solids in an upwardly flowing stream of fluid. Each particle is supported by the fluid and this suspension has most of the characteristics associated with a true liquid. Thus, it can flow through pipes and valves, and it will develop hydrostatic heads which will allow it to flow from one vessel to another.

Dense and dilute phases . . . In the turbulent fluidization region close observation of the bed indicates that a portion of the fluid is passing through in the form of bubbles, and that in general it is possible to obtain a lower dense phase of solids and an upper dilute or dispersed phase. In such a fluid bed the lower dense phase bubbles and surges in the manner very suggestive of a boiling liquid, and it is this appearance that leads to the terminology of fluidized powders. Particles from the lower dense phase are thrown up into the dilute phase, but a high percentage of them settle out and drop back into the lower dense phase. The boundary between the two phases is not a definite interphase, but it is probably about as sharp as would be observed in a violently boiling liquid.

Carrying heat . . . The results of a large number of studies have indicated a definite flow pattern with the solids moving upwards in the center, and downward along the walls of the vessel. This rapid circulation of solids gives excellent temperature control. The rapidity with which the solids flow from one location to another serves as an effective means of carrying heat, and tends to maintain the whole fluidized bed at the same temperature level. This has been clearly demonstrated in commercial operations in which the temperatures of fluid beds having diameters in excess of 40 ft. have been controlled throughout with a variation of less than 5° F.

This ability of the process to maintain an essentially constant temperature throughout the fluid bed in spite of nonuniform heat release is one of the most important characteristics for utilizing the fluidized bed. The high degree of turbulence or internal recycling that is encountered results in extremely high transfer rates for heat removal or heat addition.

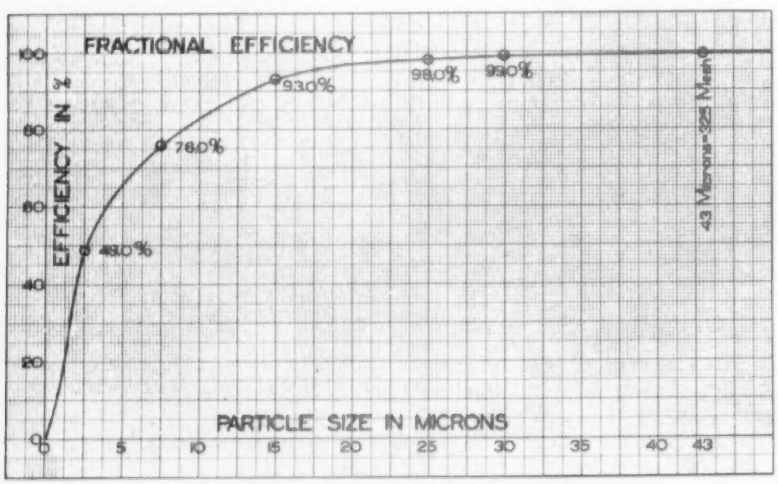

Fig. 1—Effect of particle size on cyclone efficiency.

Why Dense Phase?

A remarkable characteristic of the dense phase in a fluidized bed is that, when considering Stokes' law, it can exist in a gas stream whose linear velocity and viscosity are much greater than is necessary to transport any individual catalyst particle at a velocity approximating that of the gas itself. Since the hydrodynamic drag forces on an individual particle of catalyst are much greater than the downward pull of

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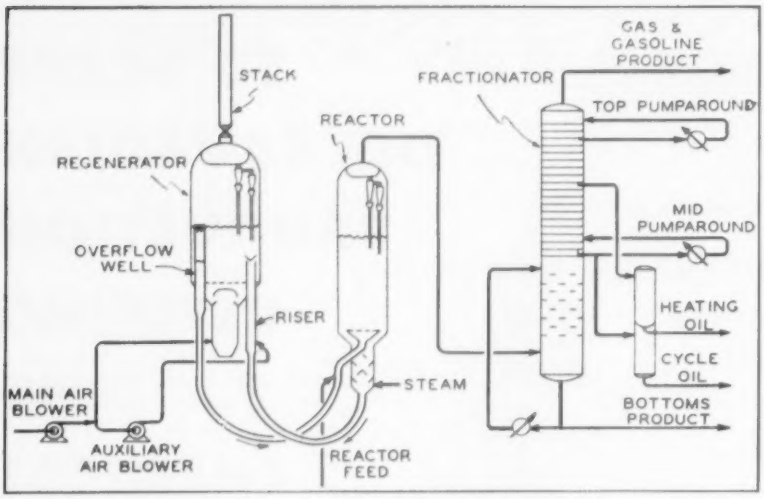

Fig. 2—The Model IV design F.C.C. unit (Standard Oil Development Co.)

gravity, it is apparent that some other factor or factors must be controlling in confining the particles to the dense phase. It has been suggested that this factor is a hindering effect produced by collisions between adjacent particles. It is also possible that the restraint is due to attractive forces between the finely divided particles of which the catalyst is composed. It is not presently possible to state whether these theories or any others that have been suggested are correct. Work is being carried out currently by various investigators which it is hoped will solve these and other questions concerning the fluid bed phenomenon.

Empirical Correlation

Though the theoretical background has not been completely developed for the fluidized powder bed, a number of empirical correlations have demonstrated some quantitative effects for the following variables:

1. Particle diameter.
2. Linear gas velocity.
3. Gas properties, such as viscosity, density, etc.
4. Particle density.

In addition to the above it is believed that particle shape and possibly particle surface area and condition might have considerable effect.

Particle Size—Coarse

In an attempt to determine the effect of particle size on fluidization characteristics, a series of laboratory studies were carried out in glass equipment incorporating sand. Table 1 presents results of a study on the use of what is called coarse material. In this case the quantity retained on 100 mesh was 1 per cent and that passing through 200 mesh was 14 per cent. The 80 plus microns material was 96 per cent. A study in glass equipment demonstrated that very poor fluidity was obtained above 0.3 ft. per second, with a slugging type of flow. The accumulation of coarse material in commercial fluid catalytic cracking units has presented one of the most serious operating difficulties in the past and even on some currently operating units.

TABLE 1—EFFECT OF PARTICLE SIZE ON FLUIDITY—COARSE MATERIAL

Size—	Per cent
+100 mesh	1
−200 mesh	14
Poor fluidity at velocity above 0.3 ft. per second.	
0-20 μ	1
20-40 μ	1
40-80 μ	2
80+ μ	96
Slugging type of flow.	

TABLE 2—EFFECT OF PARTICLE SIZE ON FLUIDITY—FINE MATERIAL

Size—	Per cent
+100 mesh	0
−200 mesh	98
Poor fluidity at velocity below 0.7 ft. per second. Deaeration and poor contact.	
0-20 μ	46
20-40 μ	39
40-80 μ	14
80+ μ	1

Accumulation of coarse material in the fluid system has resulted in excessive erosion of slide valves and carrier lines and relatively poor efficiency in the reactor and regenerator. It has also been demonstrated that these coarse materials generally are low in catalytic activity and selectivity and are generally difficult to control from the standpoint of aeration in standpipes. The theory has been advanced, and in some cases practiced, that the proper method of controlling coarse material in the system is to subject the powders in the system to attrition or to remove the material and to grind the material up. However, it has been found that the proper approach is to eliminate the coarse material by elutriation and to control the particle size of the material fed to the system.

It is extremely interesting to compare the particle sizes employed in the fluid process with those employed in the T.C.C. process. Thus, in the fluid process the common practice is to consider particle size only in terms of microns, whereas in the moving-bed process, particle size is measured in mesh size. A ¼-in. particle corresponding to an approximate 3-4 mesh number is equivalent to a 6,000 μ size. An 80 μ particle is equivalent to 180 mesh.

Particle Size—Fine

Table 2 presents analysis of what is termed fine material. In this case 98 per cent of the material passed through a 200-mesh screen and approximately 46 per cent was in the range of 0-20 μ. It has been demonstrated both in a pilot plant and on a commercial scale that the proper material for a fluidized system must consist of a blend of the fine (Table 2) and the coarse (Table 1) materials. It has further been demonstrated that excellent fluidity can be realized with a particle-size range that is extremely low in fines

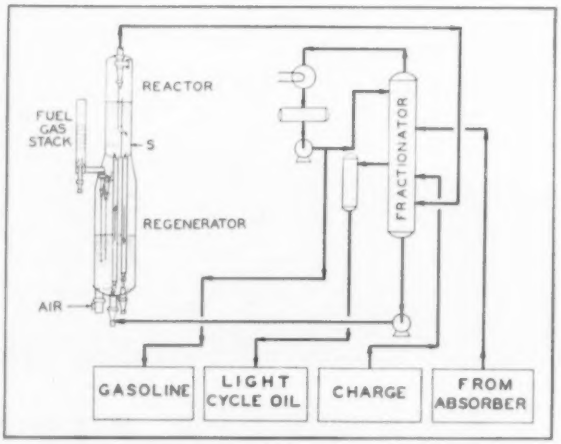

Fig. 3—Orthoflow fluid catalytic cracking unit (M. W. Kellogg Co.)

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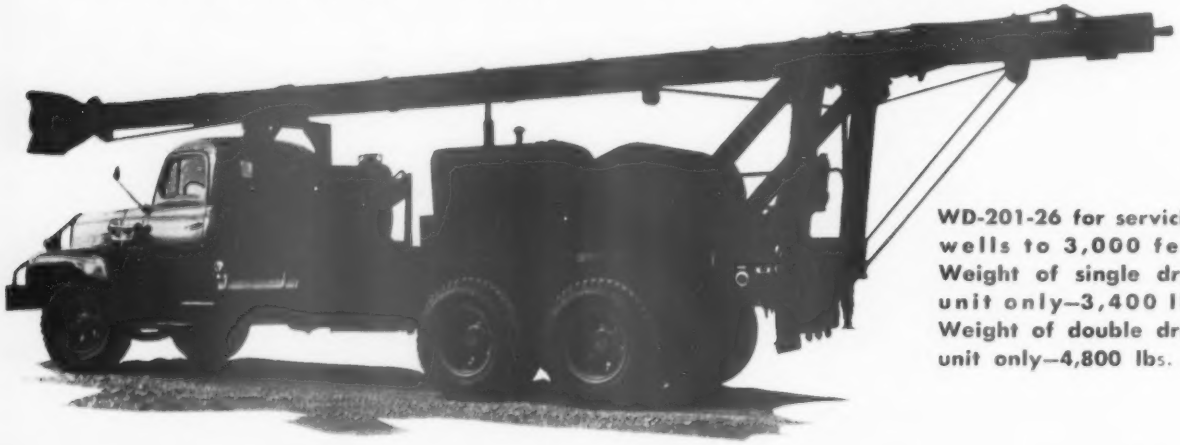

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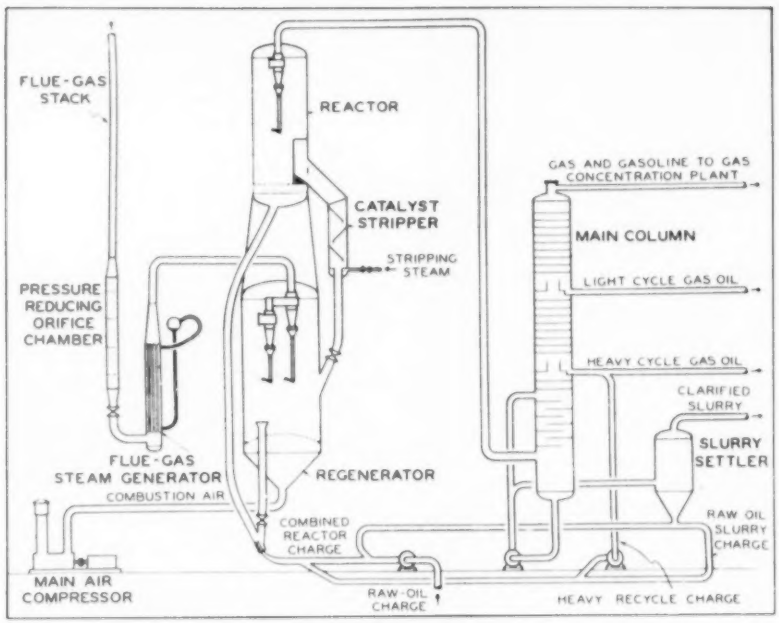


Fig. 4—Universal Oil Products Co. design of F.C.C. unit.

(0-40 μ) and low in coarse material (80 plus μ). Thus, careful attention to catalyst-recovery equipment and the fresh-catalyst makeup can result in low catalyst losses, reduced maintenance costs, and excellent efficiency in both the reactor and the regenerator.

2—HEAT BALANCE

The heat balance of a catalytic cracking unit may be divided into two parts—the reactor and the regenerator. The heat requirements for the reaction system, at a given feed rate, are determined by the reaction temperature, the heat of reaction, and the feed preheat temperature. The heat transferred to the reactor from the regenerator is a function of the catalyst-circulation rate. No one of the items affecting the reactor heat balance can be changed without a compensating change in some other item as long as reaction conditions are to be maintained constant.

Regenerator Heat

In the regenerator the heat is supplied by the combustion of coke deposited on the catalyst during the cracking reaction. Since the combustion of coke is highly exothermic, the heat must be removed by the flue gases and by catalyst circulation to the reactor. In order to maintain constant regenerator temperatures, it is necessary to vary the catalyst circulation rate to the reactor in accordance with the quantity of coke deposited in the reaction step. The above statements are made to conform with the conventional so-called heat-balance unit. In the past units have been designed with recycle catalyst coolers. It has also been suggested and practiced in some fluid systems that internal coils located in the fluid bed be utilized for heat removal.

Recycle catalyst cooler . . . In any fluid reaction system heat may be supplied or removed by the use of catalyst circulation through an external heat exchanger or by suspended coils in the fluid bed. Coils of the latter type can be expected to result in relatively high transfer rates in the order of 50-400 B.t.u. per hour per sq. ft. per °F. and by the use of automatic controls, bed temperatures can be maintained within extremely narrow temperature limits. Thus in a 41-ft. i.d. regenerator in fluid catalytic cracking containing 400-500 tons of catalyst, the bed temperatures can be controlled within 5° F. throughout by the use of a recycle catalyst cooler.

3—PRESSURE BALANCE

The fluid catalytic cracking process may be considered as incorporating two catalyst transfer systems. One system provides the means of transporting spent catalyst from the reactor and stripper to the regenerator and the other returns the regenerated catalyst to the reactor. Each system may be visualized as a U-tube manometer in which the density on one side is maintained sufficiently higher than the other in order to offset the pressure drop encountered in the system and obtain the desired flow. The difference in flow density existing between the materials in a standpipe and its corresponding carrier line permits the pressure balance to be reached and the flow of catalyst maintained once the vessel operating pressures have been established.

What is a standpipe? . . . A standpipe is a powder transport line which utilizes the principle of hydrostatic head to move the powder with gravity as the prime mover. A standpipe is always a downflow mechanism, although it may be inclined from the vertical at a considerable angle. The powder must be fluidized if it is to descend smoothly through the line and when in this condition it exhibits many of the properties of a true fluid. Thus, the difference in pressure between any two points in a standpipe is largely determined by difference in hydrostatic head of fluidized powder. Friction head and other energy terms are usually negligible in comparison with the hydrostatic effect. The weight of the entrained gas is so small in comparison to the weight of the powder with which it is associated that only powder weight is considered in calculating hydrostatic heads.

Aeration

Standpipes can be and have been operated with and without aeration. Operation without aeration can be maintained successfully as long as the flowing velocity is sufficiently high to entrain gas from the fluid bed in sufficient quantity to maintain a fluid state throughout the system. With reduced velocities it is necessary to add aeration gas so that the material will not become deaerated, thus causing a plugged condition.

It is normal practice, however, to supply aeration gas. Care must be taken not to overaerate the standpipe to a point where a critical region is reached. At this point the standpipe below the point of aeration injection will become air blocked and the resistance to powder flow becomes excessive, thereby causing a loss of standpipe differential.

One of the applications of the standpipe is found in transferring powder from a vessel at low pressure to one at higher pressure. In many modern catalytic cracking units, the standpipe is employed to overcome the system pressure drop when the reactor and regenerator are operated at essentially the same pressure. Standpipes need not always be constructed as external lines connecting to otherwise isolated vessels. The dipleg in a cyclone separator may

be considered as an internal standpipe that delivers the collected powder back to the fluid bed.

4—CATALYST RECOVERY

Normally, the major considerations in efficient catalyst recovery is catalyst cost. However, in some areas the dust nuisance is of some importance. In general, the recovery of catalyst may be carried out by various mechanical means. The most important of these follow:

Hindered settling . . . A disengaging space is provided in the upper portion of the reaction vessels which permits the settling out of the major portion of the powder entrained by the gases leaving the fluid bed. The major factors controlling the efficiency of such a system are the gas velocities and the disengaging height provided in the design.

Cyclone separators . . . The effect of velocity on the collection efficiency of a cyclone separator is pronounced in velocity ranges up to 60-70 ft. per second. Above this range the gain in efficiency with increased velocity is more than offset by the mechanical problems encountered. One of the major factors in cyclone efficiency is the particle size of material handled by the separator. This is illustrated in Fig. 1.

Filtering elements . . . In many processes the cost of the catalyst or the prevention of product contamination may dictate the necessity for 100 per cent catalyst recovery. Under such circumstances it is necessary to employ filters which are normally of the ceramic or porous metal types. In such systems it is necessary to blow back the filter elements periodically in order to avoid excessive pressure drops.

Scrubbers . . . Under certain conditions it is possible to employ, economically, the use of scrubbers in which the powder-bearing gas stream is scrubbed by countercurrent flow of a liquid stream.

Cottrell precipitators . . . It is common practice in many industries to employ Cottrell precipitators for the separation of fine dust from a gas stream. Collection efficiencies of 98-99 per cent are easily obtainable from this equipment. In most cases it is necessary to condition the gases entering the precipitator in order to increase the conductivity of the gas, thereby increasing the collection efficiency.

Some Newer Developments

During the past 2 or 3 years there have been further modifications and simplifications in the design of fluid catalytic cracking units. These designs have been developed by Standard Oil Development Co., M. W. Kellogg Co., and Universal Oil Products Co.

Model IV unit . . . Fig. 2 presents the latest design as developed by Standard Oil Development Co. This design has been termed the Model IV unit. The principal unique feature in this design is the catalyst-transfer system. In this system the feed stock enters the catalyst-transfer line carrying regenerated catalyst from the regenerator to the reactor at a point just below the reactor. The hot regenerated catalyst causes the feed stock to vaporize instantly and the oil vapor and catalyst mixture enters the reactor. Spent catalyst leaves the reactor through the second catalyst-transfer line. The density of the catalyst flowing up the riser to the regenerator is lowered by introduction of air, and thus the catalyst is forced into the vessel under its own pressure head.

The rate of air flow to this spent-catalyst transfer line establishes the catalyst-to-oil ratio in the system without the use of throttling slide valves. In the older designs these slide valves were employed to control catalyst circulation. In the Model IV design, catalyst circulation is controlled by density differentials in the catalyst-transfer system. It should also be noted in Fig. 2 that the catalyst-recovery system consists of two stages of cyclone separators in both the reactor and regenerator.

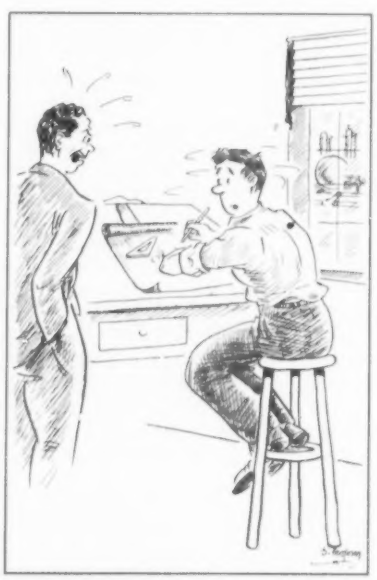
Orthoflow . . . Fig. 3 presents the latest Kellogg design commonly called Orthoflow. The unique features in this design consist of the fact that the reactor and regenerator are in a common shell with an internal head separating the reaction zones. A single standpipe is employed to introduce catalyst from the reactor into the regenerator, this standpipe being located internally with a plug type valve incorporated for control and shutoff purposes. (Actually this is a cone-shaped valve, roughly like a large needle valve.) Regenerated catalyst is introduced into the reactor through an internal vertical line. Here again the flow is controlled by a plug-type valve (truncated core) which has a hollow center through which oil and steam are introduced into the system.

U.O.P. design . . . Fig. 4 presents a typical flow diagram of a late U.O.P. design. Here the reactor is also located above the regenerator but is actually a separate vessel supported on the regenerator by means of a skirt. The spent catalyst is stripped in an external stripper and flows through a standpipe and slide valve that is external. The regenerated catalyst is withdrawn from the bottom of the regenerator through an external slide valve and is conveyed by means of oil and steam through an external carrier line. It will be noted that as in the case of Model IV and the Orthoflow designs, catalyst-recovery system on the regenerator consists of two stages of cyclone separators and no precipitator.

Eliminating Mechanical Difficulties

Much has been said in the past concerning mechanical difficulties encountered in both the T.C.C. and fluid catalytic cracking processes. It should be stressed that through years of operating experience the major mechanical problems encountered in earlier designs have been essentially eliminated in the design of recent units.

In the fluid process such factors as the erosion of lines, slide valves, and cyclone separators have been materially minimized in new units by the proper design of equipment and careful consideration of process requirements. In the T.C.C. process the use of the gas lift has eliminated the severe mechanical problem encountered when employing mechanical elevators. It is current practice with many operating companies to operate their catalytic cracking units for a period of a year or more before shutting down for inspection and repairs. In some cases fluid units have operated for periods as high as 600 days before shutting down.



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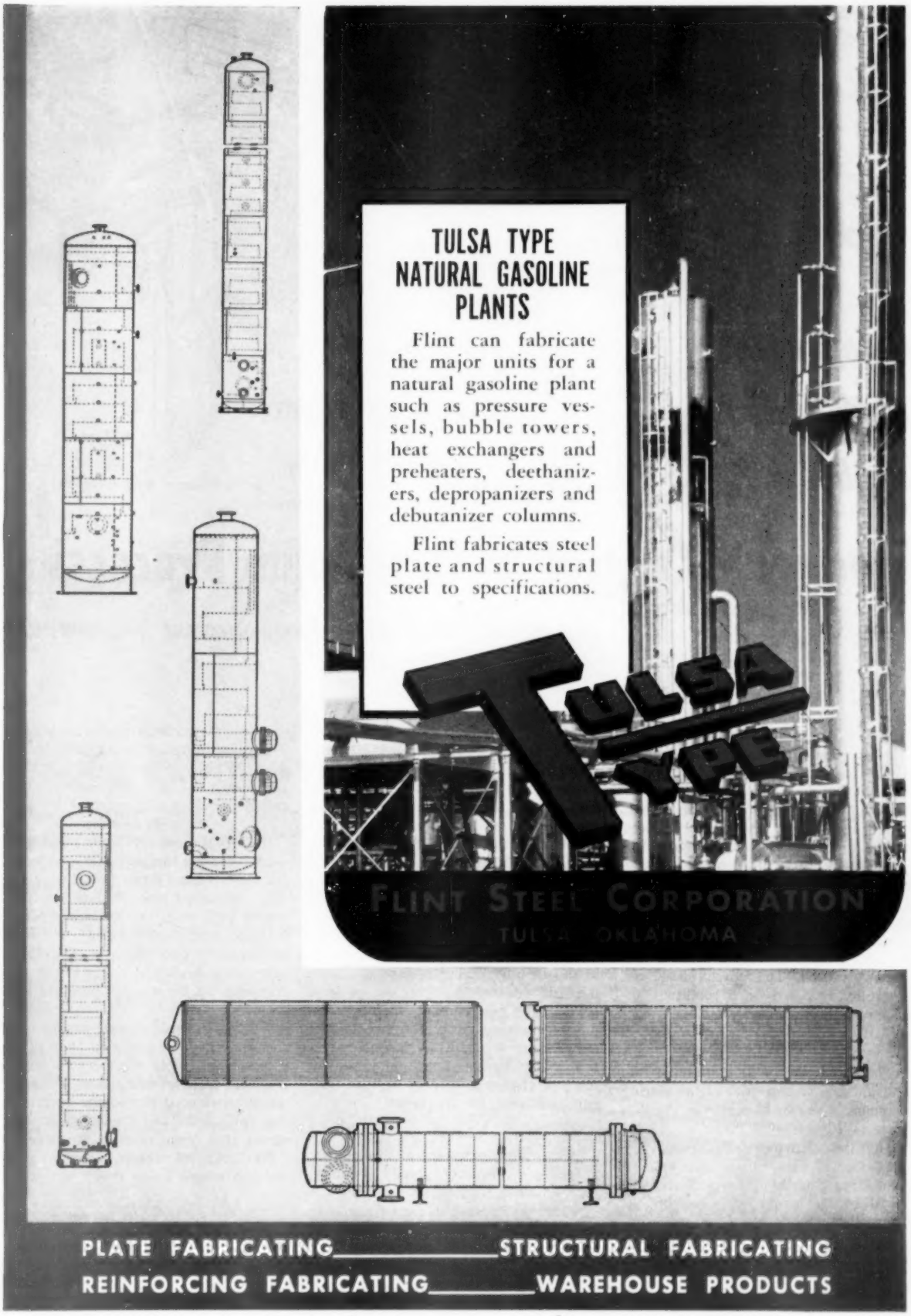
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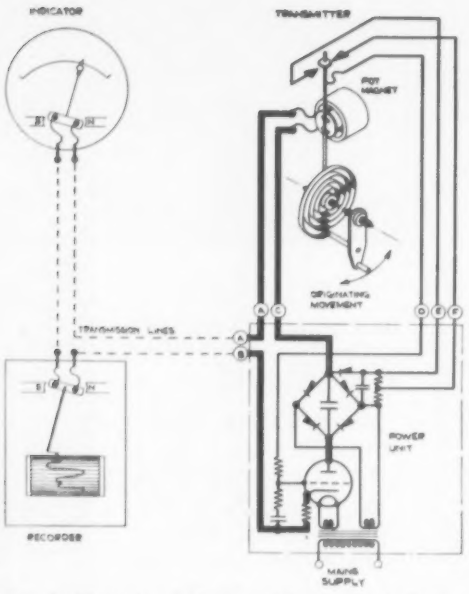

Fig. 1—Measuring and transmitting units, indicator, and recorder.

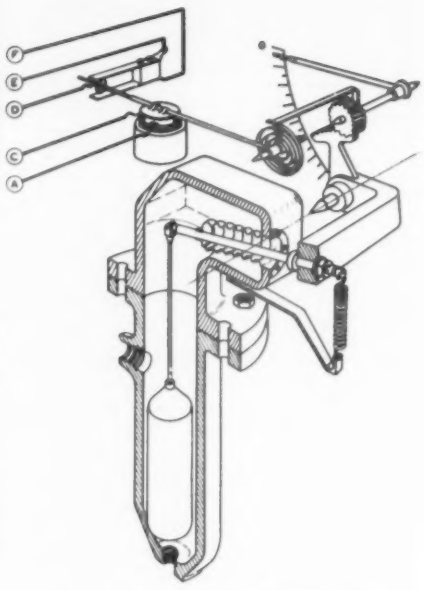

Fig. 2—Displacer level transmitter.

Electronic Control in Petroleum Processing

. . . *and achieved flexibility of measurement and operation*

by W. T. Marchment

ELECTRICAL indication and control has been used successfully in steel works and for other industrial applications. Experience obtained in these installations, together with advancements in servomechanism techniques, made it logical to consider application of electronic control systems to the process industries.

The equipment described here is employed by Anglo-Iranian Oil Co., Ltd., in refinery application in England. In this equipment a current-transmitting system is used. The operation of the controller is based on a modified application of the same system.

1—CONTROL SYSTEM

The principle of operation of the transmitting system for all measuring elements is shown basically in the diagram of Fig. 1.

The transmitter is a torque-balancing device in which the torque exerted by the originating movement is balanced by the torque of a coil operating in the cathode circuit of a thermionic tube. The balancing coil is connected in series with simple milliammeter movements in indicators, recorders, and controllers, which therefore receive signals proportional to the measured quantity. When in balance, a contact connected to the grid of the tube and carried by the balancing coil is in a neutral position between two fixed bias contacts, the voltage on the grid being maintained by a storage capacitor between grid and cathode.

Any unbalance created by a change in the quantity being measured causes the grid contact to touch the positive or negative bias contact, thereby raising or lowering the plate current until the system is again in balance. The transmitter compensates automatically for any change in supply voltage, circuit resistance, or frequency.

Level

For the measurement of level under pressure, a displacer-type level-detecting element is used, as shown in Fig. 2.

Variation in level changes the apparent weight of the displacer which is measured by a calibrated spring. The displacer is connected to a pivoted lever which operates through a bellows seal and winds up a small spring whose torque is therefore proportional to level. The spring torque is opposed by that of the balancing coil previously described and shown in Fig. 1. The current in the coil is therefore a measure of level.

Specific Gravity

The level displacer, shown in Fig. 2, is used for the measurement of specific gravity in ranges down to 0.2 sp. gr. In this application, the displacer is fitted with a bellows at the lower end which is filled with liquid having the same temperature coefficient as the liquid being measured. The readings are thus compensated for any temperature variation.

For very sensitive measurements of specific gravity, a modified form of the displacer principle is used in which a displacer force on one side of a beam is directly balanced due to the current in the coil. Tests on a pilot plant have shown that sensitivities in the order of 0.0005 can be achieved, the range of the instrument being 0.025 sp. gr.

Flow

The flow transmitter is shown diagrammatically in Fig. 3. The manometer is fabricated from stainless-steel tube to form the measuring and range tubes.

Author is controls manager, Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, London, W. 4. From paper presented at I.S.A. conference, Chicago, September 21-25, 1953.

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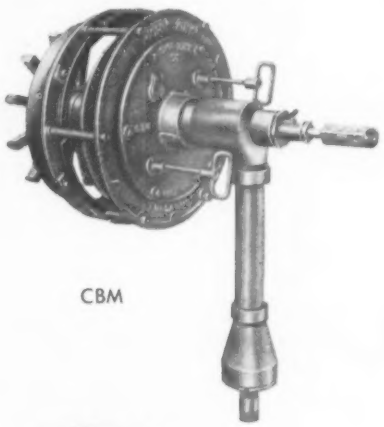

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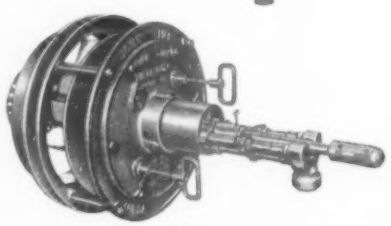

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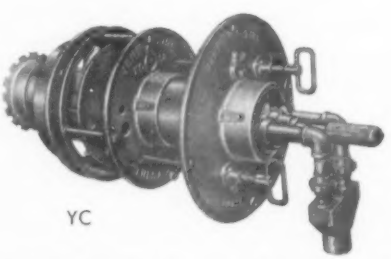

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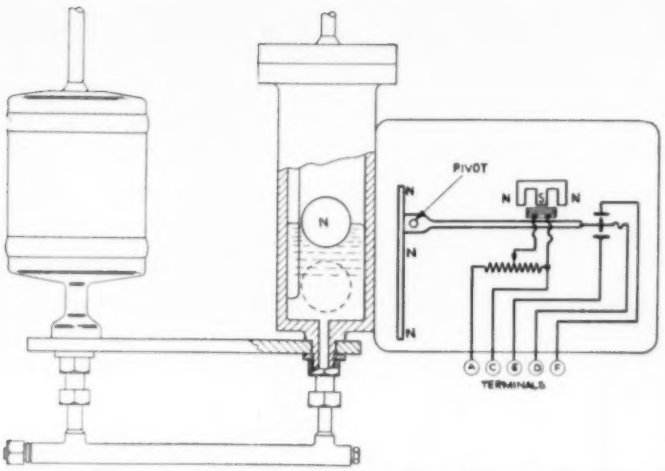

Fig. 3—Electronic repeater system. Diagram of connections of flow transmitter (high range).

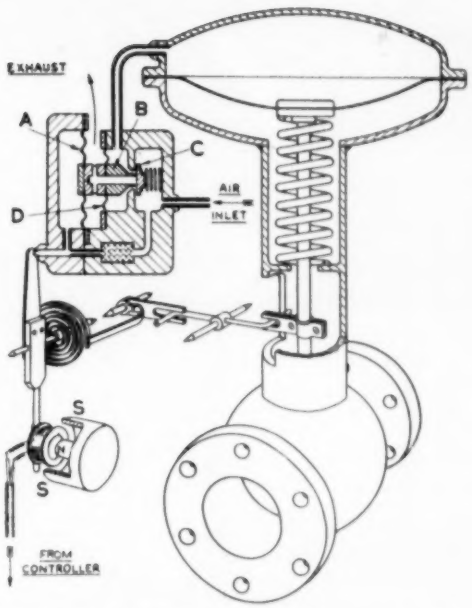

Fig. 4—Remote electric control of air-operated valve.

A cylindrical magnet, polarized along its axis, floats on mercury in the measuring limb of the manometer and exerts a repelling force on a pivoted strip magnet which is mounted externally and carries a balancing coil.

With zero differential, the repelling force acts through the fulcrum of the pivoted magnet; and therefore, no turning moment exists, and the balancing current is zero. With a change in mercury level, the cylindrical magnet rolls to a position away from the fulcrum, producing a turning moment and deflecting the balancing coil. In deflecting, the appropriate bias contact is made and the plate current varied, until the torque exerted by the coil balances that due to magnetic repulsion.

The current in the coil and instruments connected in series is, therefore, proportional to the differential head.

Where it is desired to transmit current proportional to flow, a current squaring device is used in the form of a dynamometer balancing coil. The transmitter may then be connected to milliampere-hour meters for integration or totalization.

Temperature

For measurement of the small potentials generated by thermocouples, a modified form of the transmitting system shown in Fig. 1 is used.

In this case, however, the transmitter operates as an electromotive force (e.m.f.) balancing device, and is essentially a resistive feed back amplifier. The thermocouple e.m.f. is balanced by a feed-back voltage derived from a resistor in the cathode circuit of a thermionic valve. The plate current, 0 to 30 ma., is, therefore, proportional to the thermocouple e.m.f. and may be used to operate indicators, recorders, and controllers.

Any unbalance is detected by a robust moving-coil galvanometer carrying a shutter which controls the amount of light on two photoelectric cells connected in a bridge circuit. The bridge voltage is applied between grid and cathode of a thermionic tube, thus varying the current to bring the system again in balance.

An output of 30 ma. is obtained for an input of 10 mv.; and due to resistive feed back and consequent high input impedance, the thermocouple circuit resistance is not critical.

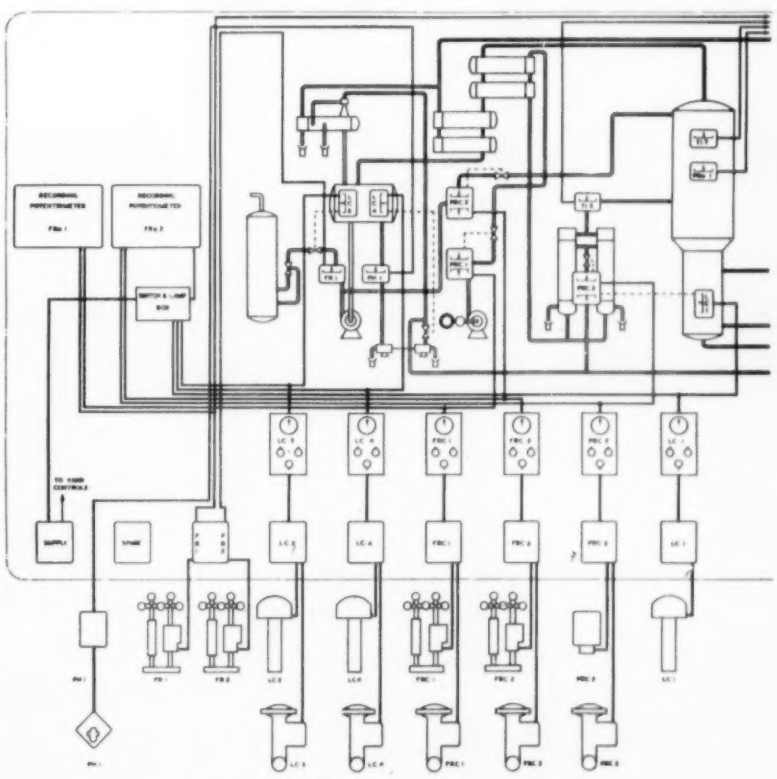

Fig. 5—Schematic diagram, desk control for rerun unit.

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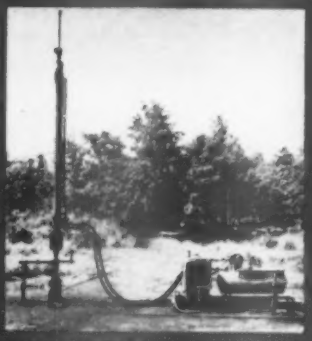

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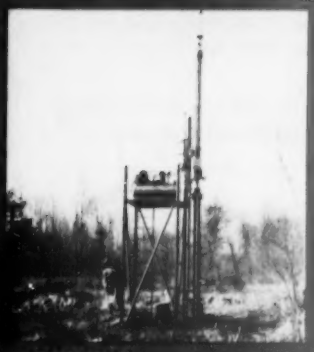

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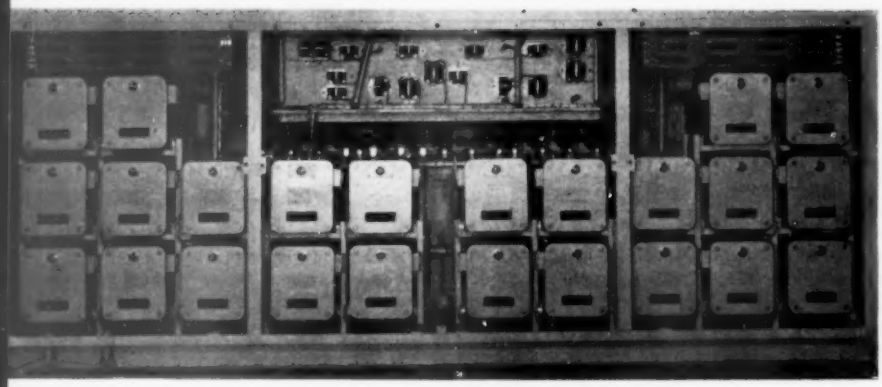

Fig. 6—Back of control desk showing controllers.

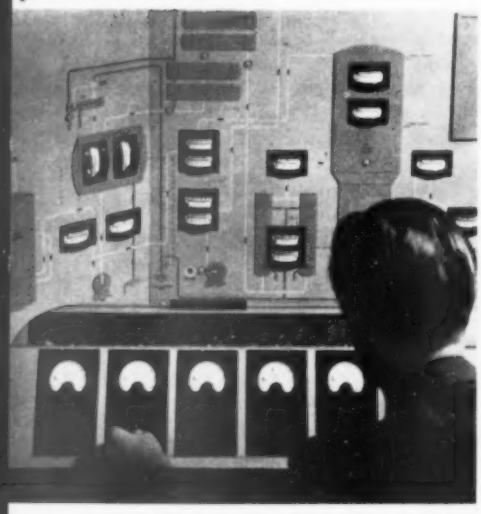

Fig. 7—Enlarged view of graphic diagram, desk control.

Cold Junction Compensation

A temperature-sensitive bridge is used to effect cold junction compensation. A resistance thermometer element forms one arm of the bridge and is located near the galvanometer coil. A proportion of the bridge output is in series with the thermocouple and provides a compensating voltage for changes in ambient temperature.

For suppressed ranges, the values of the fixed arms of the bridge are chosen to provide a backing off voltage.

A constant voltage for the temperature-sensitive bridge is achieved by a further bridge network which includes a stabilizing lamp.

The electronic transmission system which has been very briefly described here can be further modified to obtain reset and derivative action, as well as proportional mode, or to combine these modes in a free-function instrument.

Provision is made for transfer from manual automatic control without disturbing the stability of the process.

Construction of Controller

The case is constructed to form a **flameproof** enclosure and may, therefore, be used in hazardous atmospheres.

Proportional, integral (reset) and derivative adjustments are mounted on the cover of the case with indicators showing controller output and measured value. Further calibrated adjustments are provided for manual control and desired value. Manual or auto control is effected by a three-position switch labeled Service, Hand, and Auto. The service position enables the controller to be serviced while under manual control.

The various components are mounted on trays which are plugged into the rear of the case. One tray also includes the thermionic tube and associated power supply of the transmitting unit.

Valve Positioner

The controller output is fed to the coil of the valve positioner, Fig. 4. The coil operates in the field of a permanent magnet and is attached to one end of a pivoted beam, the other end having a flapper covering the nozzle of a low-bleed air relay.

The torque exerted by the coil is proportional to the controller output current, and is opposed by the torque of a spring which is varied by a lever connected to the valve stem.

Any change in output current will unbalance the beam and cause the flapper to move relative to the nozzle and increase or decrease the air pressure on diaphragm A of Fig. 4.

In the balanced condition, the force on diaphragm D equals that on A; but with an increase in pressure on A, the hollow plunger (B) is moved and the spring-loaded valve (C) opened to admit air to the head of the control valve. With a decrease in pressure on A, the hollow plunger is moved away from its seating and the valve head connected to exhaust.

It will be seen that the valve stem moves in an appropriate direction and varies the torque of the spring until it equals that of the coil. The valve position is directly proportional to the output current from the controller, or, 0-15 ma. is equal to 3-15 psi. air pressure.

2—SOLVENT-EXTRACTION UNIT

The instrumentation of an SO_2 solvent-extraction unit represented the first full-scale application of the electronic process control system.

The plant was designed for a throughput of 400 tons per day, and is now operating at about 500 tons daily to produce premium-grade kerosine.

The instrumentation consists mainly of level, flow, and pressure control with associated electrical alarms for high level and excess pressure. Four temperature controllers are the only instruments on the plant which are not electrically operated.

Control-Room Panel

A conventional type of panel is provided in the control room. Seventeen levels, four flows, and three pressures are automatically controlled. The controllers were changed to the type described in this paper after operating continuously for 15 months. The modifications included the provision of indicators for the measured value and controller output on the cover, and the rearrangement of the adjustments for the proportional, reset, and derivative functions.

Only one example of cascade control exists on the SO_2 plant, in which a proportional interface level controller resets a flow controller. This is achieved by the simple expedient of feeding the output of the level controller into the desired value circuit of the flow controller, terminals being provided for this purpose.

The disk chart recorders have moving-coil milliammeter movements, the charts being driven by **flameproof** synchronous motor clocks.

Alarm System

An alarm system is provided to give an audible and visual warning should a high level occur in two traps connected to the suction side of two compressors. Displacer level transmitters provide a signal current to an alarm circuit. The signal is received by moving-coil relays having contacts which may be adjusted to any predetermined level.

In operation, the moving-coil relay

energizes a secondary relay, which closes the circuit to warning bells and lamps. Should the alarm condition be ignored for any reason, a second moving coil relay, with contacts set at a higher level, automatically shuts down the appropriate motor-driven compressor.

A similar alarm system is used to give warning should the steam condensate from the evaporators be contaminated with SO_2. The detector is a conductivity meter connected to an ohmmeter movement-type alarm relay. The contact is set at a value representing high conductivity due to contamination by SO_2.

Cancellation buttons are provided for canceling the audible signal and leaving on the visual signal, and these are arranged to automatically reinstate the alarm circuit when normal conditions are resumed.

Transmitters

Displacer level transmitters, mounted on columns, have bodies of welded steel construction and are suitable for a working pressure of 600 psi. The displacer float and bellows seal are in stainless steel. An external adjustable spring is provided which enables the units to be calibrated for different fluid densities.

As previously mentioned, the flow meters operate on a magnetic force balance principle, thus making it possible to dispense with glands. The meters are constructed for a working pressure of 1,500 psi.

The pressure transmitters consist of pressure elements which vary the torque of a helical spring proportional to pressure. The torque is balanced by the transmitter coil.

Maintenance

The most outstanding point when commissioning the plant was how quickly the operators accepted an entirely new system of control. To some extent, this was due to the knowledge that controller component trays could be readily changed if necessary and that an entirely separate circuit existed for hand control. It is, however, interesting to note that only two trays have been used as spares during an operational period of 15 months.

The highly corrosive nature of the liquids and gases dealt with in an SO_2 plant proved a valuable test for the equipment mounted in the plant; but only minor changes were found necessary, and these were mainly concerned with the finish of materials.

While the instrumentation of an SO_2 plant is not complex, it has proved the reliability of an electrical process control system operating with a minimum of maintenance.

3—RERUN UNIT

A portion of the instrumentation layout for a centrifugal control desk or console type of graphic panel is shown schematically in Fig. 5. It represents the left-hand side of the desk, and shows the connections to the various transmitters in the plant. The complete scheme comprises 24 measuring and transmitting units for flow, pressure, and level, and 6 vapor pressure thermometers being used as originating movements to convert pressure into a measuring current of 0-30 ma.

Two self-balancing recorders are used for recording flow. A further one operates from thermocouples being used for temperature. Manual selection of 24 points is also provided by a self-balancing potentiometer indicator.

Controller Adjustments

As distinct from the conventional panel discussed previously, the controller adjustments are mounted on the front of the desk below the graphic diagram, as shown in Fig. 6. Those for proportional, integral (reset), and derivative settings are protected by a sliding cover which may be locked if necessary.

The desired value, manual, and hand auto controls, are mounted on miniature panels together with an indicator showing the controller output or valve position.

Flow Recording

The input to the self-balancing potentiometer flow recorder is 10 mv. and is derived from the voltage drop across a shunt carrying the flow transmission current. The flow meters are provided with current-squaring balancing coils. The transmitted current, therefore, is linear with flow.

Permanent records of flow are provided by 6 and 12-point recorders operating from 10 flow transmitters. The 12-point recorder makes available a further 6 records which may be selected by switches. Each switch has two positions enabling 6 out of 12 measurements to be recorded. The selected records include certain pressure, flow, and level measurements, for which permanent records were considered unnecessary.

Graphic Diagram

As seen in Fig. 6, the measured quantities are indicated on miniature edgewise milliammeters arranged as part of the diagram. In some cases, duplex indicators are used; the upper scale indicates the measured value and the lower scale the desired value, the latter being controlled by the calibrated desired value adjustments.

The temperature points, which are manually selected, are represented by colored lamps on the diagram. These light up to confirm the particular point selected.

Controllers

The controller components are mounted on trays in air-purged cases arranged in banks and contained in the rear of the desk, as shown in Fig. 7. The trays may be readily removed for replacement or inspection.

4—OTHER UNITS

It may be of interest to refer to some new features which are included on catalytic polymerization and topping units now in construction.

Miniature recorders of the topping type, having a chart width of 2 in., will be used for all measured quantities and will be mounted on the side wings of the control desks.

Certain flow-meter readings will be integrated or totalized by milliampere-hour meters included in the transmitter circuits.

For the topping units, the control adjustments will be mounted on miniature panels forming part of the graphic panel. The panels will include the calibrated adjustments for the three-terms, measured value, and controller output indicators, desired value and hand auto control. Temperature will be measured and controlled by resistive feed-back amplifiers mentioned earlier.

Electrical Methods

While in this article a particular system has been described, it must be emphasized that electrical methods as a whole offer considerable advantages to the process industries.

Apart from eliminating transmission lags between measuring and control elements in the plant, and the control instruments in the control room, a flexibility of measurement and control can be provided, which is not possible with any other medium.

The signals of product quality variables are in many cases of an electrical nature. For example: density, viscosity, pH, humidity, and conductivity. To these may be added the many end-point analyzers which use the electrical medium for their operation, and will form part of the instrumentation of future plants.

It will be appreciated that the signals from the quality detectors can readily be fed into the desired value circuits of electrical controllers, either directly, or via a computing circuit which will deal with a plurality of signals.

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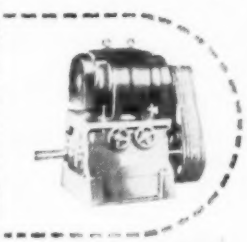

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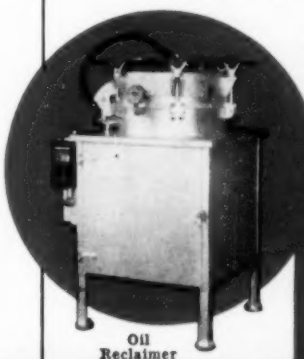

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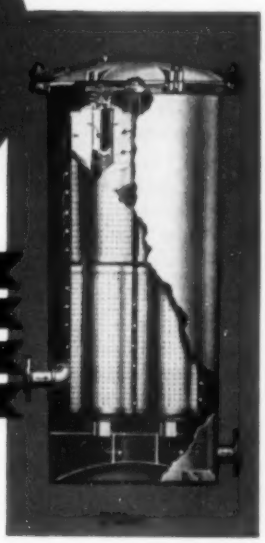

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A petroleum geologist appraises the

Outlook for Oil in the Atomic Age

Atomic energy is not a threat to our energy requirements in the immediate future—the job of keeping the United States supplied with liquid fuels will be tremendous, but it is a job geologists can accomplish.

by D. A. McGee

D. A. McGEE

THE AUTHOR

D. A. McGee is executive vice president of Kerr-McGee Oil Industries, Inc., Oklahoma City. He has guided the firm through a program involving pioneer operations in the Gulf offshore areas, Middle East drilling operations, and the acquisition of a uranium mine and nearly 1,000,000 acres of uranium leases. McGee joined Phillips Petroleum Co. in 1927 and, in 1935, was named chief geologist. In 1937 he became vice president of Kerlyn Oil Co. in charge of production and exploration. He has held his present position since 1942.

DURING the past few years there have been those who wondered publicly how long the present rate of discovery and production can be maintained in the United States. Can geologists continue year after year to add to reserves and at the same time meet new peaks in production?

Will they need help? Does atomic energy offer an immedite threat to oil markets or is it a long-range energy source that will be available to share a substantial part of our increasing energy requirements? Are there other possible energy competitors?

Numerous guesses as to the energy requirements of the United States 10 years or even 100 years hence are available. Informed estimates indicate 10 million barrels of oil per day may be needed by 1960, and five or six times our present supply in 100 years. The expansion of the uses of gas probably will be limited only by the supply available.

Solar Energy

While much has been said about the fission of the atom and the impending great commercial uses of such energy, little has been said about developments in the solar energy field. These have been important and may eventually be far reaching in their effects on our every-day lives.

In addition to the fossil fuels, principally our oil and gas along with coal, biological forms currently growing or even cultivated for chemical storage of energy from the sun apparently offer a real promise. Chlorophyll, or similar chemicals, make possible the vital reaction known as photosynthesis and consequently chemical storage. In recent years certain algae similar to the green scum on ponds have been found to synthesize about 3 per cent of the incident solar energy. These algae are known as "Chlorella."

Research done for the Carnegie Institute shows that a 1-acre tank exposed to the sun and supplied carbon dioxide and chemical fertilizer can produce up to an estimated 35 tons per year of Chlorella. Chlorella can be selected to produce either proteins or carbohydrates. Some strains produce a dry weight content of as much as 50 per cent proteins. The mass production of carbohydrates for fuel in the same way appears to be possible. The amount of annual sunshine in two-thirds of the United States is such as to make the storing of energy through photosynthesis entirely feasible. Chlorella-like biology seems promising as a future means of storage of the sun's energy in useful form and in large quantities. The energy storing efficiencies of the Chlorella make it possible to visualize algae tank farms dotting our western deserts or under certain conditions algae cultivated on the flat roof of a long ranch house to provide all the protein and some of the carbohydrate for the family living below.

It is interesting to note that the total usable fossil-fuel supply of the whole earth is much less than the solar energy falling on the earth in 1 year. Furthermore, presently known reserves of oil and gas are estimated to represent something less than 4 per cent of this fuel supply.

Atomic Energy

Since the first bomb was dropped on Japan, atomic energy has been in the minds of people all over the world, not because of its possible commercial applications but because of its terrible death-dealing potentialities as an instrument of war. In the last few years, however, much research and development have been done toward harnessing this new wonder energy source for commercial purposes. The interesting thing about atomic energy is that two purposes—war and commerce—can be pursued simultaneously. While material is produced for bombs, fuel can be produced in an atomic power plant. A pound of uranium when burned completely in a reactor is estimated to produce the same amount of energy that is contained in 200,000 gal. of fuel oil.

The problems in connection with the application of atomic power to industrial uses on a competitive basis are far from solved, however, the technology of power-making reactors is still in an experimental stage although such reactors on a pilot-plant basis have already been successfully built and tested. There is no known way to transform the energy of fission directly into power. At the present time all of the thinking contemplates a heat cycle very similar to that used by the firebox and the generator in the ordinary oil-burning, steam-electric plants. In this case the reactor is the firebox. In addition, it is a highly radioactive firebox which will be very difficult to overhaul and maintain since no one may safely go near it.

It appears that by the end of the next 10 years we may expect power plants that can compete favorably with those burning oil, it being estimated that up to 10 per cent of our electricity may be generated in atomic-powered plants. It appears there will be in operation reactors capable of producing power and breeding nuclear fuel from urani-

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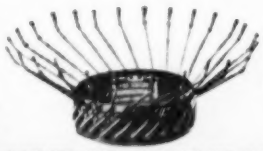

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um or thorium at the same time. There should be atomic engines in submarines as well as possibly large surface vessels and aircraft in military applications where military value can not be measured in dollars. Since atomic power can be obtained as a byproduct in the making of nuclear weapons, it probably will be for some time a subsidized product, the cost being borne largely by the taxpayer.

World-wide social and political conditions may influence the economics of atomic power as much as technology. But there appears to be no doubt that the long-term contribution of atomic power will be far reaching; however, for the foreseeable future it will supplement and not replace oil and gas uses.

Uranium reserves . . . Since uranium is largely the raw material of atomic power, the future of atomic power depends on the supply of uranium. The reserve of uranium in the world has been estimated at 25 million tons or an energy reserve of U_{235} (the atom that fissions) alone of 30 times our present estimated oil reserves. The annual consumption of oil and its products in the United States has been estimated to be the equivalent in energy of the fission of 140 tons of uranium. There is, therefore, plenty of evidence that uranium will be sufficiently abundant in the world to be used as fuel.

While accurate figures understandably are not available, someone has estimated that the United States at this time has a reserve of 100 thousand tons of uranium in minable ores. Thorium, while it has not received much attention, is also an important fission material.

Uranium sources . . . Most of the uranium that has been and is now being produced in this country comes from the Colorado Plateau area where it is found in the form of secondary minerals—principally carnotite. This area is now considered second only to the Belgian Congo as a source of uranium. Carnotite, a canary-yellow material, is found deposited in sedimentary beds, principally the Morrison formation of Jurassic age. Porosity and permeability changes and structural attitude—those things with which we are concerned in our search for oil—seem to influence the accumulation of carnotite and other similar minerals.

In the past few years uranium has been found in other localities—principally in the Black Hills area where again it is found in the Morrison and the immediately overlying Dakota and Lakota sandstones. Recent exploration has shown that the occurrence of uranium is not limited to Jurassic and Triassic periods but that its occurrence will have a very wide stratigraphic range. Commercial deposits have been found in beds of recent Tertiary age. The Chattanooga shale of Devonian age is radioactive in many parts of the country and is known to carry small amounts of uranium over wide areas. In the Panhandle gas field of Moore and Sherman counties, Texas, the Permian producing section contains, dispersed in the limestones and dolomites, minute particles of black residual material that is highly radioactive. Sufficient amounts of the material are carried in the gas stream in many of the wells to make the gas radioactive. The phosphate-bearing limestones of Florida, Wyoming, and Idaho contain sufficient uranium to make its extraction profitable as a byproduct to the processing for fertilizer. Unfortunately, the occurrence of pitchblende—the primary, high-value mineral of uranium—appears very limited in the United States. Canada and the Belgian Congo at this time are principal producers of this mineral in the Free World.

Uranium exploration . . . Many of the exploration methods used in our search for oil and gas can be applied to exploration for uranium.

Much of the structural and stratigraphic data that we, as geologists in the oil business, have accumulated over the years could be very useful in selecting areas in which to search for uranium. Even though long-range, uranium promises to be to some extent a competitor for the energy market. In the interest of national defense and the future of our country we, as an industry, should give serious thought to providing some means whereby the vast store of knowledge on structural and sedimentary geology available to petroleum geologists can be applied to the search for uranium. Also, a coordinated, industry-wide effort should be made to log for radiation, all our shot holes and wildcat tests. Samples from our wells should be examined with a radiation detector at the same time they are examined microscopically. Small, efficient counters are available at low cost.

Oil shales . . . Progress continues to be made on the extraction of oil from shales and the cost is approaching a competitive level. There appears, however, no immediate possibility of the construction of large-capacity plants for this purpose.

Questions Answered

Thus, in answer to the last two of the three questions that initiated this discussion, it appears that atomic energy is not a threat in the immediate future to our energy markets; rather in the next decade or two it may gradually supplement the uses of oil and gas. Also, there are no other serious competitors at this time for our markets. Solar energy has interesting possibilities but much research and development must be done before commercial uses can become a reality.

In answer to the first question, it seems safe to predict that the oil industry will be called upon to supply the ever-increasing energy needs of our country for some time to come and that our industry will look to us to keep it abundantly supplied with crude oil and natural gas.

Have our past accomplishments been such as to give us confidence in our ability to do the job? While the application of some geology to the search for oil apparently began with the Drake discovery, the first known publication on oil written by Thomas A. Gale, in June 1860, less than 10 months after Drake's discovery, devoted a chapter to the geological conditions of the region. It was not until after the turn of the century that petroleum geology began to achieve professional standing.

Geology accepted . . . As the early pioneers in petroleum exploration successfully guided those few in the industry who were willing to listen to improved oil-finding methods, first geology and then later geophysics were tentatively accepted and finally solidly established. Exploration then took its place alongside of production, refining, marketing, and pipe lining as a full-fledged and highly respected unit of the industry. Prejudices were laid aside and geologists were accepted as being fellow workers by field personnel which in early years certainly was not always the case.

Year after year as a profession we steadily gained stature and the years up to the late 1930's can be aptly described as the period in which we achieved maturity. We developed methods and geologic concepts and saw new oil fields result from them. We improved techniques and gained confidence and set the stage for our greatest years of endeavor. It is thought provoking when you realize most, if not all of our methods, devices, tools, and many of our geologic concepts were developed in this period. It is true that techniques, especially in geophysics, have had almost continuous improvement since then, but the methods were first successfully used in what can be called the preatomic period.

Accomplishments to Date

Since the completion of the first commercial oil well, less than 100 years ago, an estimated 76 billion barrels of oil has been discovered in the United

States. Slightly over 45 billion barrels has been produced. Of this 76 billion barrels, almost exactly half has been added in the last 15 years. As much oil has been found in this short period as was discovered in the preceding 78 years. Despite the vast quantities that have been taken from the earth, known reserves of crude oil in the United States totaled 29 billion barrels on January 1, 1953, compared to 15.5 billion barrels on January 1, 1938.

Production . . . It took the American petroleum industry 70 years to reach an annual production of a billion barrels a year, but it took only 19 more years to hit the 2-billion barrel level. In 1938 we were producing 3.5 million barrels per day. Now we are producing at the rate of about 6.5 million barrels a day and consuming at a rate slightly over 8 million barrels per day.

Production of natural gas has shown an even more staggering increase. In 1938 the total natural-gas production in the United States amounted to 2.3 trillion cubic feet and reserves were estimated at 71 trillion cubic feet. By 1949 the total gross production of natural gas in the United States amounted to 7.5 trillion cubic feet. By 1952 the production had risen to 8 trillion cubic feet and gas reserves were estimated at about 197 trillion cubic feet.

Reserves . . . Viewed from the standpoint of total supply, the reserve situation has become less favorable since the turn of the century because year by year the energy requirements of the United States increased more rapidly than our reserves. In the first 20 years we lost ground rapidly and in the last 30 years slowly. In 1900 when we were producing 63 million barrels a year, our reserves were 2.9 billion barrels and we had 47 years of supply. In 1910 it was 22 years; in 1920, 16.3 years; in 1930, 15.1 years; in 1940, 14.1 years; and, at the end of 1952, 12.5 years.

In the year 1937 we found 3,722,000,000 bbl. of oil, more than in any single previous year and more than has been found in any single subsequent year with the exception of 3 of the last 5 years. We found a total of approximately 38 billion barrels of oil from 1938 through 1952. These figures show that we have enjoyed our most prolific years since 1938.

Reasons for success . . . We have achieved this success by a coordinated, cooperative effort which has applied with maximum efficiency the manpower, the knowledge, the experience, and the methods available to us. We have achieved it by laying aside jealousies and rivalries between groups and working as a team for a common result. As we have needed to step up our exploration effort, we have simply added more of that which we were already using successfully. We have used our subsurface geological knowledge and our concepts of oil accumulation to the maximum in directing the use of those methods perfected in earlier years.

For instance, reflection seismograph crews in operation increased from 200 in 1938 to 663 in 1952. This tripled use of seismograph did not result in a greatly diminished rate of return per unit as might be expected, as gaged by dividing the number of units into the barrels of oil found. In 1938 for each seismic unit in operation 15.25 million barrels of oil was found, in 1948 approximately 9 million barrels was found, and in 1952 9.5 million barrels per unit were found. There are other combinations of statistics which support the conclusion that we are able to expand greatly the use of our methods without affecting seriously the finding power of each unit.

What of the Future?

While it is very heartening and a source of great pride to glance backward and see how well we have done, the question is: can we continue to add to reserves and at the same time meet new peaks in production?

At the moment, the assumption that we will have new peak demands to meet may appear ill founded for we are in another of those periods of oversupply which from time to time afflict our business. This saturation of markets and leveling off of activities should be of relatively short duration. In the long-range picture the expanding energy requirements of our country can only call for further large increases in oil and gas production.

New sources of oil . . . Since there are no new exploration methods in sight, we must depend on an even more intelligent and skillful application of the ones which have served us so well for the past 15 years. We can apply these methods to exploration of new areas by pushing deeper into the structural basins which have already been partially explored, by undertaking exploration in those unexplored areas where the sedimentary section offers promise, and by drilling deeper in some of the older, already productive territories. We can develop the oil in the tidelands off our Gulf and Pacific coasts. Without question, many billions of barrels of oil and trillions of cubic feet of gas will be found in those virgin areas where structure and stratigraphy are so attractive for large accumulations. The distance seaward the search will be pushed may, to a large extent, be determined by economics rather than geology.

We can continue to collect, assemble, and study data and disseminate it widely in the hope that some new approach may be devised that will permit us to search for stratigraphic accumulations of oil with more assurance. We must admit that in the past our discoveries of this type have been more by accident than by intent. A low-cost method for drilling exploratory holes is badly needed. All of us have at one time or another developed ideas as to areas that offer possibilities for stratigraphic oil but have laid them aside because the chances for success were not commensurate with cost. Unfortunately, at this time no such low-cost drilling device is in sight.

Geologists hold key . . . We can continue to lean on our colleagues in the industry who have made great technical advances in devices and methods for exploiting, conserving, and recovering oil, such as electric logging, acid treating, gun perforating, gas pressuring, water flooding, fracture treating, and core analysis, to mention a few that have materially aided in increasing our supply of oil. We can continue to hope for the development of some entirely new methods, but in the final analysis we must depend upon what we already have—the greatest asset of which is the trained and imaginative minds of our profession. The job of keeping our country supplied with energy will be tremendous but we can accomplish it.

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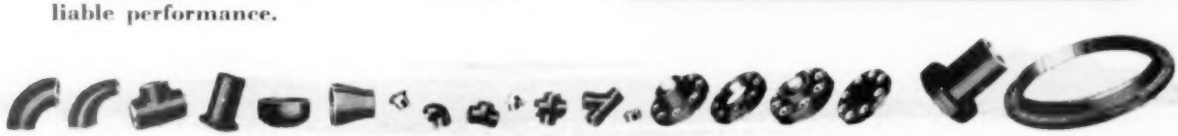

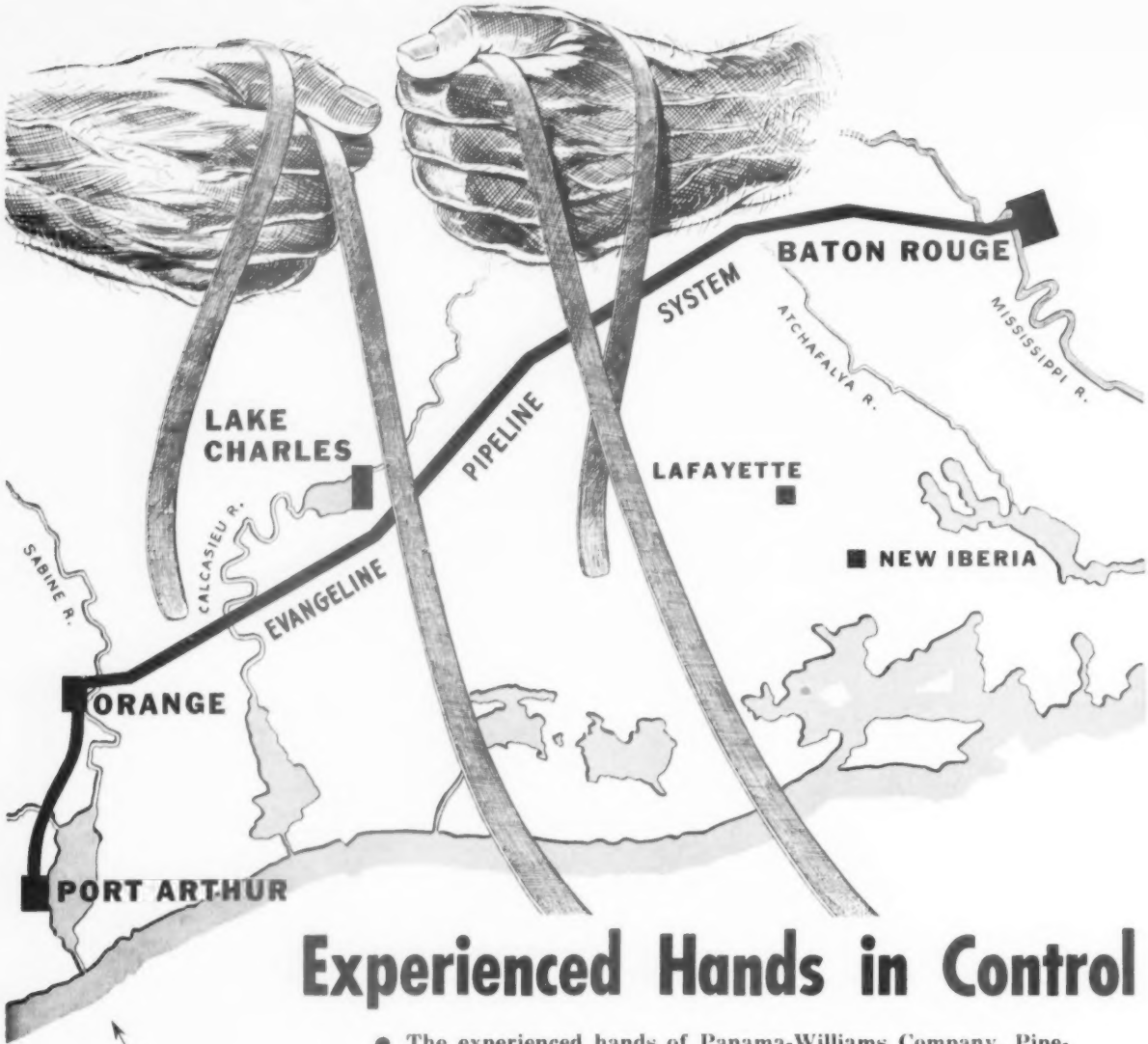

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PANAMA-WILLIAMS COMPANY

PIPELINE CONTRACTORS

HOUSTON

New Evangeline Products Pipe Line System

(Continued from page 93)

the past due to the fact that when the booster pump starts, and before the clapper closes the bypass, a considerable velocity will be established in the bypass, thus making the clapper produce serious "water hammer" when it closes the bypass. To eliminate this undesirable condition, these particular valves are equipped with a holding-type motor operator connected in series with the booster pump.

In starting the booster pump to deliver product from the tank to the suction manifold for the main-line pumps, the following sequence takes place:

1. The pump-motor push-button "start" in the pump station is closed which causes the torque motor switch to close and the torque motor operates to lift clapper up against the bypass seat of the dual-seat bypass valve.

2. As the clapper seats and closes off the bypass, a limit switch is closed which closes the circuit on the pump motor switch causing the pump to start. The clapper, meanwhile, is held securely against its seat by a self-locking gear drive.

3. The booster pump will take suction from the tank and deliver to the manifold without any flow being set up in the bypass to cause water hammer.

In stopping the pump, the pump-motor push-button "stop" is closed in the pump station which opens the pump-motor switch and allows the pump motor to stop. The torque-motor reversing switch—operated on a time delay to allow pump to stop discharging closes and the torque-motor returns clapper to a closed position, thereby shutting off the pump discharge. The bypass is now open to receive incoming product and the pump is protected against reverse flow.

Suitable valve arrangement is included in the system to open lines to the tank, outgoing manifold, and incoming manifold.

Dual strainers . . . At Port Arthur the three incoming lines are run through a meter bank having 6-in. meters capable of handling 1,000 bbl. per hour each. This posed a problem in the strainers, for a strainer capable of handling this volume would have a basket so large as to be unwieldy and it would either have to be unreasonable in length or in diameter.

A large diameter would naturally mean a top with a flange requiring so many bolts that it would take considerable time to change baskets. A smaller flange and a longer-length basket would mean its having to be lifted very high to be removed from the strainer case. Likewise, this would require a chain hoist and trolley located high above the strainer.

This problem was solved by using two moderate-sized strainers connected in parallel. In effect, it meant the design height—on the basis of a small-diameter basket—was cut in half, permitting a compact unit to be installed. In addition, a quick-opening coupling similar to those used on scraper-trap barrels was installed on the top of each strainer which can be quickly unscrewed, swung out of the way, and the smaller, 75-lb. baskets lifted out and quickly replaced.

Equalizer line . . . At Port Arthur, Lake Charles, and Baton Rouge, the meter runs consist of five meters in parallel, each being preceded by its individual dual strainer. Four of the meters are normally in use, with the fifth used for standby purposes. However, even though this standby meter run was available, it was decided to install an equalizer line to give added versatility to the meter bank.

The equalized line extends perpendicular to the meter runs and is placed between the meters and the strainers. It is connected to each meter run between each individual strainer and meter. The valving is so arranged that any one strainer can be used for any of the five meters.

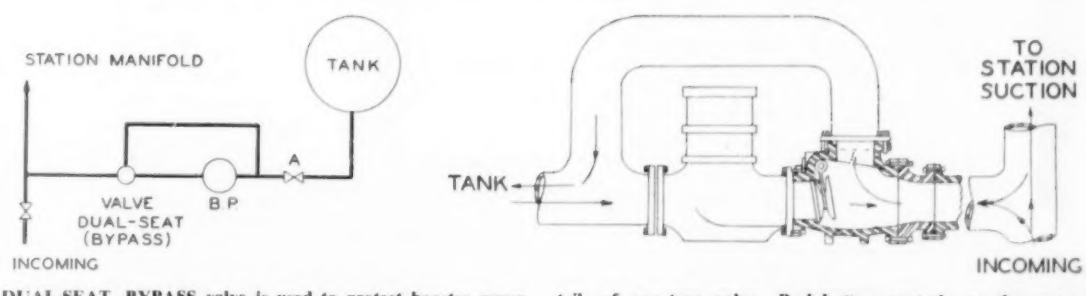
If four meters are running and one of their corresponding strainers becomes clogged, even to the point of no flow, the remaining three strainers will supply the four meters at equalized pressures because of the equalizer line. Also the fifth strainer can be used if desired without changing out the original four meters. This assures that all meters will run at equal speed at all times regardless of the condition of the strainers.

Automatic strainer . . . An automatic, water-filled type strainer has been installed on the main line just upstream of the meter runs at the Baton Rouge end of the line. It is hoped that this particular strainer, once the line gets into continuous operation and is cleaned and inhibited, will eliminate the use of dual strainers in the line, with their required periodic cleaning.

The automatic strainer consists of a large steel drum inside of which a cylinder rotates. Inserted in this rotating cylinder are many small, (1-in. diameter) cone-shaped cup strainers having a fine wire-mesh covering. An electric motor rotates the inside cylinder continuously and the liquid to be strained passes from the outside to the inside of the cylinder through the wire-mesh cup strainers.

A vertical slot is located on one side of the outer cylinder which runs its entire length. This vertical slot is connected to a 2-in. line which runs to the sump. When a valve located in this 2-in. line is open, some products will be run through the cups in reverse as they pass this slot, and this backwash will clean the cups.

With this arrangement it is possible to use a differential-pressure gage to actuate the electric drive to the motor-operated valve on the sump line. When the differential pressure across the



DUAL-SEAT, BYPASS valve is used to protect booster pump, "B.P." against reverse flow and to eliminate bypass water hammer. Simplified diagram at left shows positions of valve, pump, and tank in the transfer system. Diagram at right shows details of new-type valve. Push-button controls on the system are used to lock the valve clapper in its desired seating position for any given flow.

strainer amounts to 20 psi., the valve automatically opens and remains open while the inside cylinder makes two or three revolutions, after which a time switch will cause the motor operator to close the valve. A bypass is provided around the automatic strainer to isolate it during maintenance operations.

Remote control . . . A booster station at Lake Charles is set up to be completely controlled by means of circuits superimposed upon the communication lines between it and the Port Arthur station. Circuits have been established so that the three pumping units at Lake Charles together with the suction and discharge valves may be controlled individually from Port Arthur.

Station conditions were analyzed and it was decided that in addition to the regular remote controls, it would be desirous to have the following indications made at Port Arthur station:

1. On unit basis

(a) Seal-leak indicator — pumps are equipped with seals.

(b) Pump-case temperature.

(c) Motor overload.

(d) Bearing temperatures on both motor and pump.

(e) Indication of whether pump is running or idle.

(f) Indication as to whether pump or motor is ready for operation, in case it is being repaired on test.

2. Station indicators

(a) Whether excessive gases leaking into switchgear control room.

(b) Auxiliary power condition—this power operates relays, etc.

(c) Station contact—to insure that communication circuits which carry signals between stations are operative.

Thus, with the above controls and indications it is possible for the Lake Charles station operations to be handled from Port Arthur.

Line and Station Construction

The Evangeline Pipe Line runs in a direction slightly north of east from Port Arthur to Baton Rouge, passing slightly south of Lake Charles and Opelousas and closely parallels Federal Highway 190 from Opelousas to Baton Rouge, crossing the Mississippi River upstream of the highway bridge.

Difficulties . . . Laying of the line was complicated by 14 water crossings, rice fields, marshy terrain, tree stumps, and a record-breaking rainfall which caused operations to come to a standstill shortly after they had begun.

Running west to east, the line crosses the Sabine River, Intracoastal Canal, Vinton Canal, Chioupique Bayou, Calcasieu River, Nezpique Bayou, Teche Bayou, Cortableau Bayou, Wing Canal, Darboane Bayou, Atchafalaya River, Morganza Floodway, Groose Tete Bayou, and the Mississippi River.

The crossing of the two large rivers —Atchafalaya and Mississippi — were made by dredging a ditch so that pipe was buried a minimum of 3-4 ft. below the bottom, while crossings of all other streams were made minimum of 5 ft. below bottom. Pipe at river crossings and in some 3-4 miles of watery swamps was concrete coated to provide it with a 10-lb. negative buoyancy when line is empty.

The Atchafalaya crossing was a distance of some 2,700 ft. while the Mississippi crossing covered approximately 3,700 ft. In both of these crossings a cutterhead dredge was required to extend the ladder on the dredge some 50 ft. to reach maximum depths of 85 ft. in both rivers. This required increased flotation to be added to the dredge. The Atchafalaya crossing was pulled, with individual sections made up in yard on bank and pressure tested before being tied on to the rest of the line. The Mississippi crossing was made by using a laying barge and again individual sections being made up on the bank and tested prior to laying.

The 16-in. o.d. line was made up of 52.36-lb. per ft., 0.312-in.-wall pipe with the exception of the two main river crossings where heavy-wall pipe

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HOW TO FIGURE THE COST OF STEAM TRAPS

STEAM TRAPS are something like wives. First, there is the cost of securing one and installing it in its new home. Then, there is the cost of maintaining it. Now, everyone knows that some wives are frugal and help their husbands a great deal, while others are frivolous spendthrifts. It is the same way with steam traps. You have to figure the original installed cost, the maintenance cost and the effect on general operation.

Divide the total expenses by life of the trap and you get down to the real heart of the matter—the *cost per year.* This is where Armstrong steam traps really shine! Let's take a look at the details:

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1. First Cost. The price of Armstrong traps is low in terms of capacity. An optimum relationship between leverage, bucket weight, bucket travel and orifice size gives big capacity in a small package. Armstrong steam trap capacity ratings are based on *actual* tests with condensate at steam temperature and with actual hookups. They tell you what the trap will deliver *on the job.* This is not generally the case with other trap ratings.

2. Installation Cost. In four of the most widely used sizes, Armstrong traps are available in either side inlet—side outlet or bottom inlet—top outlet body styles, making possible the simplest, lowest cost installation.

3. Maintenance Cost. 40% less maintenance with Armstrong traps is the average of all the maintenance reduction reports secured from users over a period of years. This is due to high quality of parts, generous safety factors and inverted bucket know-how.

4. Repair Parts Cost. Armstrong heat treated chrome steel valve parts, precision ground and lapped, last a long time. When they do require renewal, a complete new valve mechanism right off the factory production line transforms an old trap into a new one at low cost.

INDIRECT COSTS

1. Cost of Steam Waste. This cost occurs through leaky trap valves, through traps that stick open or lose prime, through extra hours of operating heat transfer equipment due to poor drainage. This is a cost you can eliminate with Armstrongs.

2. Cost of Efficiency Losses. Poor trapping cuts heat transfer efficiency. Figure how much 10% loss affects the return on a $5000 production unit, or a $1,000,000 plant. Armstrong traps discharge condensate and air as fast as it accumulates, keep steam equipment at peak productive efficiency.

3. Cost of Downtime. Armstrong traps stay on the job long and faithfully, eliminating the production losses caused by excessive downtime for maintenance.

A steam trap casts a mighty big shadow that is multiplied by the number of traps in a plant until it has a major effect on operating costs. When you figure the costs from all angles you will find it pays to specify "traps shall be Armstrong."

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5. Can the trap stick in open position?
6. Is the trap apt to lose prime?
7. Are the published trap capacity ratings accurate and reliable for trap selection purposes?
8. Will the trap cleanse itself of ordinary dirt and scale?
9. Is the trap easy to install, inspect and repair?
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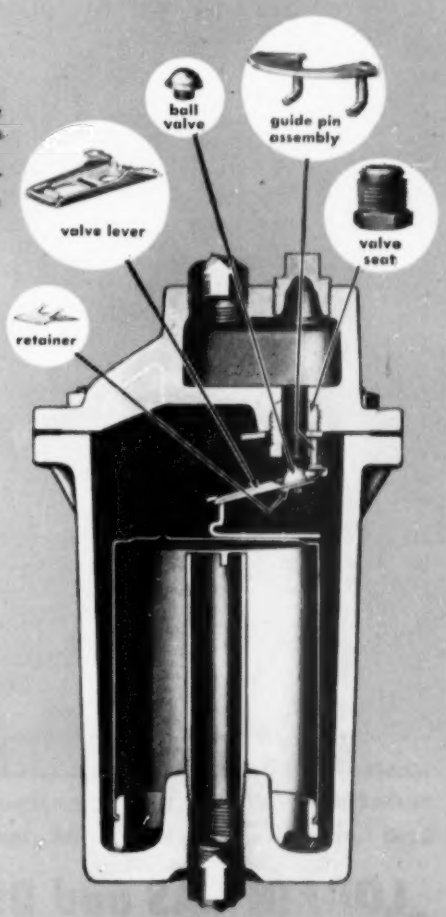
If the trap is an Armstrong, the answer to each of these questions is favorable!



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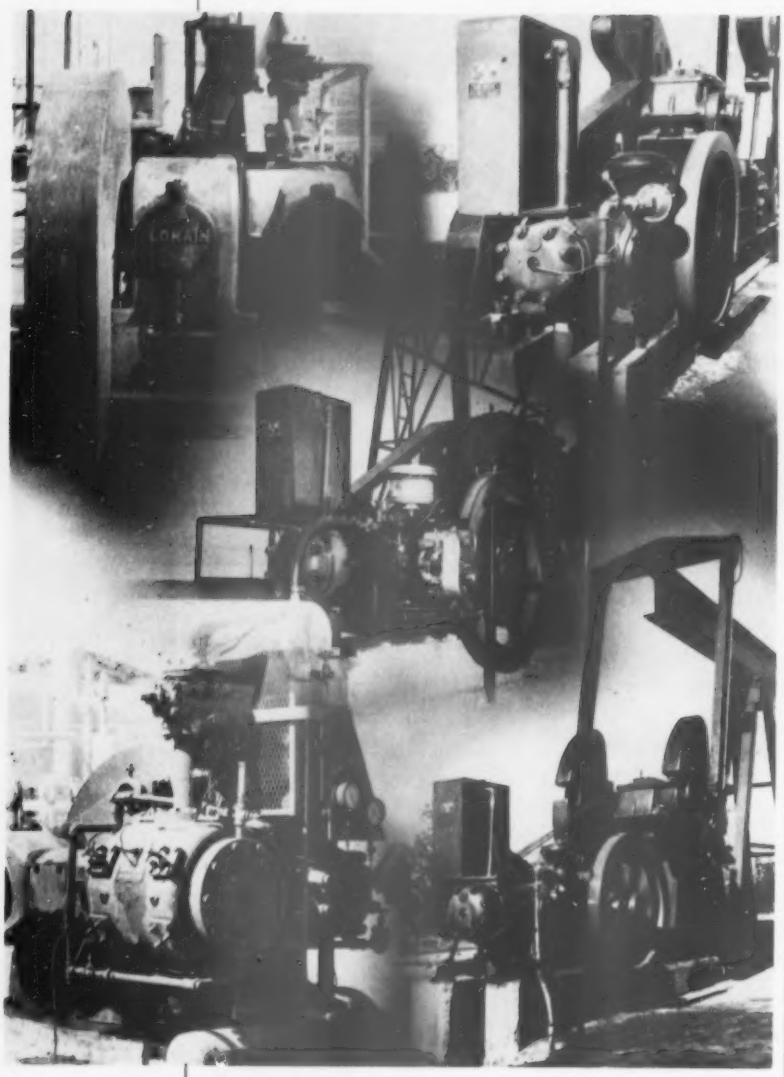

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WHITE-ROTH

—57.48 lb. per ft., 0.344-in. wall—was used. The entire line was yard-coated with temporary coating yards set up along the line's route for convenience. These were located at Orange, Tex.; Welsh, Edgerly, Eunice, Port Barre, and Livonia, La.

The line, with the exception of the water sections, is double coated and double wrapped. This consists of first priming the pipe, then coating with enamel, then making a glass-fiber wrap, then using another coat of enamel and finishing off with an outside wrap. The outer wrap is a glass-felt pipe-line wrapper consisting of a glass-felt body with continuous, parallel glass-felt fibers imbedded in the saturate.

Rice fields added to the problems in laying the line, for the line crossed 120 rice fields in which it was necessary to prevent water in the fields from running out during actual laying operations of the line. This, together with the marshy terrain and the laying of line near the intracoastal canal, where it was necessary to use barges for 17 miles, made pipe stringing a difficult task and it was sometimes necessary to use Athey wagons to carry pipe since trucks could not manuever the right-of-way. A 34-in. cumulative rainfall during the spring caused local floods which additionally hampered operations.

The line was laid by two spreads, both beginning at a point north of Jennings, La., at State Highway 25, and one working east and the other west. Work began on May 1, but it was necessary to shut down on the sixteenth due to rainfall and floods. The western end of the line was completed by July 26, with the eastern end completed by August 28, with the considerable difference in time due primarily to the high-water conditions along the eastern section of the line.

Contractor for the line was Panama-Williams Co., Houston. Subcontractors included: J. O. (Red) Willett, Monroe, La., pipe stringing and hauling; J. Ray McDermott, New Orleans, dredging and marine equipment; Rosson-Richards Co., Houston, pipe coating. It is interesting to note that on all work performed by these contractors, not a single injury resulted, a truly enviable safety record.

Pump stations . . . At the initiating Port Arthur station are located two main pumping units, one 400-hp. and one 800-hp. two-stage centrifugal pumps. The pumps are driven by induction-type electric motors with forced-draft ventilation.

The suction and discharge on the pumps are in line both horizontally and vertically making it possible to set the pumps in series side by side on identical foundation and also makes it pos-

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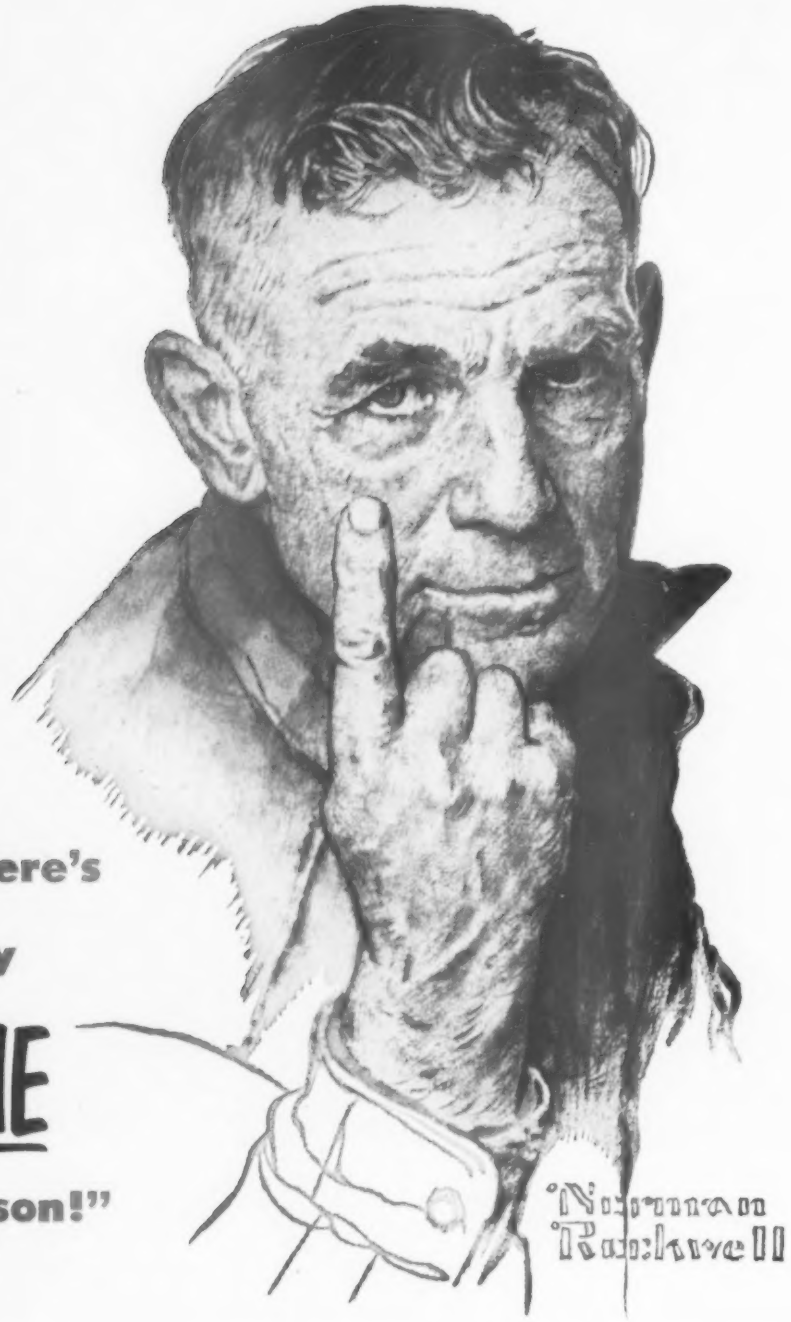

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sible to expand the pump house to add future pumps in a row. For instance, at all stations one wall of the pump house has a removable panel so that when future units are installed it is only necessary to remove the panel, extend the brickwork, and then replace the panel at the end of the new building extension.

All suction and discharge valves are motor operated with the switchgear arranged for push-button control on the control board so that one button starts an entire unit by sequence control. When the button is pushed the sequence operates to:

1. Start blower.
2. Open suction valve.
3. Start motor.
4. Open discharge valve.

The control desk at Port Arthur consists of flow chart showing pumping units, and suction and discharge piping. On the wall to the left of the operator is the flow chart of the tank farm with tank-farm piping and manifold shown. On the wall to the right of the operator is the flow chart for the entire system, including Lake Charles station and Baton Rouge terminal. Push-button control is used on all manifold valves, booster pumps and tank valves, and the control for the units at Lake Charles.

An interesting feature of the Port Arthur terminal is the use of rollers to accommodate movement of the pipe due to temperature changes. The pipe was all placed above ground to facilitate maintenance, and was naturally subjected to considerable contraction and expansion due to temperature changes. It was necessary to have at least one 90° bend between each tank and manifold to cut down on movement of the pipe reaching the manifold. In addition the line was placed on rollers and anchored at suitable locations so that movement would be relatively unhampered by solid braces.

Emergency . . . Both Lake Charles and Port Arthur stations are arranged electrically so that should a pump case or pipe in pump room burst or other emergency of this type occur, the operator can push a crash button which will shut off all power in station immediately, including telephone circuits, so it will be impossible to ignite gases. A crash button is also located outside the station so that it may be operated without going into the pump building.

At Lake Charles, in addition to cutting off power, the crash button will operate valves outside station to shut off all line pressure in the station and bypass the stream around the station. At Port Arthur a similar arrangement shuts off all pressure in the station building.

An auxiliary station is provided about 100 ft. from the pump house so that the operator can resume operation or perform any operations in safety. From this point he may turn on explosionproof lights located at strategic points in the pump house and in case gases have blown into the switchgear room, he can turn on an explosionproof blower which will purge the area of gases. In normal operations, this blower keeps the switchgear room and control room pressurized while ventilating fans in the pump room are arranged to maintain a slight vacuum. Any leakage of gases, therefore, cannot go to the higher-pressured areas of the control room and switchgear room.

Another safety feature of the line is an automatic electrical connection between Port Arthur, Lake Charles, and Baton Rouge which shuts down the entire system instantaneously should the pressure at Baton Rouge exceed the 175-200-psi. range. This is to protect against the possible closing of valves in the delivery line.

Stations were constructed by Station Construction Co., Houston.

Acknowledgments

Acknowledgment is made to S. G. Kershner and R. B. Trow, The Texas Pipe Line Co., for their cooperation and assistance in the preparation of this article.

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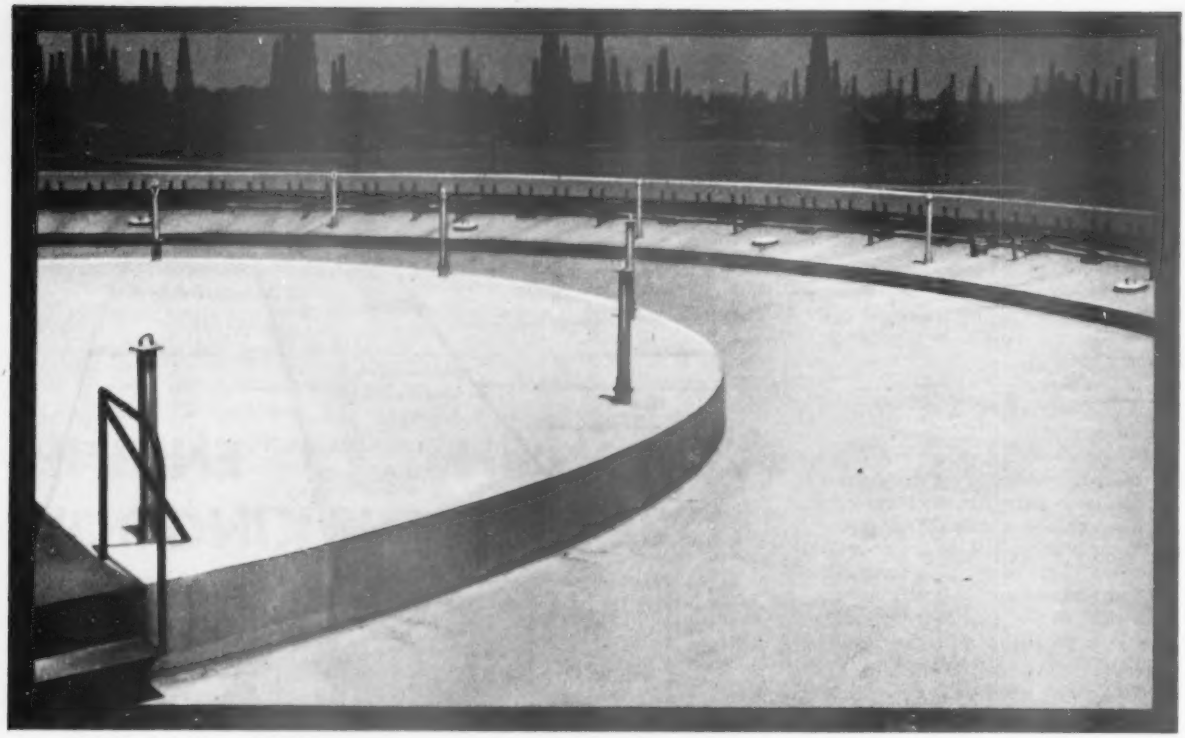

Paint on oil-tank roof "STILL LIKE NEW"

— after more than 3 years rough service

The entire floating roof of this oil tank is protected with a coating based on BAKELITE Vinyl Resins.

Service conditions are rough. Direct rays of the sun beat down. Water accumulates in low spots. Yet, the coater reports that, today,

"the deck on the first tank which is now over three years old looks just as good as the day they [our men] walked away from it."

Compare this performance. The small photo shows a tank side finished at the same time with ordinary paint. Direct sun isn't so great a factor. Yet, paint failure and rust stains are very evident. However, note the top rim, finished with a coating based on BAKELITE Vinyl Resins, is in excellent condition.

Hundreds of case histories show that coatings based on BAKELITE Vinyl Resins do a better, longer-lasting job in rough service. This is true whether applied on metal, masonry, or other materials. It's specially true where there is exposure to rough treatment, chemicals, salt water, weather extremes, industrial gases. Properly applied, these coatings won't crack, chip, peel or fade. They protect for years, require no maintenance and save many dollars on your operating costs.

For a list of suppliers and a copy of our free booklets, "BAKELITE and VINYLITE Resins for the Petroleum Industry," and "BAKELITE and VINYLITE Resins for the Chemical Industry," write Dept. RX-68.

Photos courtesy Plastic Coating Corporation, Houston, Texas.

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BAKELITE COMPANY
A Division of
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A.P.I. Preview

(Continued from page 91)

only two cases is there a reasonable, immediate hope for atomic power. The first concerns locations remote from supplies of conventional fuels where modest electric power requirements (5,000 to 25,000-kw.) are met by diesel units today. And the second, viz., submarines, removes economic considerations in favor of national security.

However, should the Atomic Energy Act be modified to remove the AEC monopoly on ownership of facilities for producing fissionable material itself, industrial interest and participation in these activities would be stimulated. The difficulties arising in such a policy change should be surmounted.

DR. W. L. DAVIDSON.

Acquiring Properties Through Oil Payments And Related Methods

THIS paper will cover the tax and accounting aspects, to both buyer and seller, of various methods of financing the acquisition of properties out of future oil runs from both the property acquired and from other properties of the purchaser.

These methods will include straight financing on notes with assignment of oil runs; the standard A-B-C transaction involving the reservation of an oil payment from the acquired property by the vender of the property and its subsequent sale; the use of oil payments covering properties other than the one acquired in the transaction; consideration measured by barrels of oil without restriction as to the source of the oil; and a modification of the old lease and bond agrements used in mining transactions.

G. W. WELSCH, Lubrand, Ross Brothers, & Montgomery.

Economic Change and Business Plans

BECAUSE of technological developments and basic historical trends, the changes in domestic economy which have taken place during the past 20 years are not likely to be reversed. Therefore, long-term business decisions must take into account the fact that, instead of permitting a free play of market forces, limits are set or group concentration taken.

Furthermore, it is necessary to find answers to such questions as: Will incomes rise further, and will redistribution tendencies continue? What is the economic logic of America's world position? What cannot be escaped, and what do these facts mean for the freedom of action and level of demand which American business will experience?

RICHARD B. HEFLEBOWER, Northwestern University.

Propane Transportation And Storage on a Products Pipe-Line System

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- **Setting Time Controlled.** Can be accelerated or retarded from 30 to 120 minutes.
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- **Great Pumpability.** Remains fluid during 80% of setting time.
- **Attains Maximum Strength.** 2500 pounds per square inch compressive strength—one hour after setting.
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Howco crews, working with the newest, finest equipment, use CAL-SEAL Super-Strength Gypsum Cement to do special oil well cementing jobs quickly, dependably. United States Gypsum has been making CAL-SEAL since 1938 for super strength and stabilized, controlled set. It's teamwork like this—combining technical knowledge, expert service, and years of experience—that helps you increase production.

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per-owned facilities at Borger and transported to shipper-owned facilities at Paola, Kans.; East St. Louis, Ill.; and Kankakee, Ill. Shipper-owned storage facilities include conventional aboveground storage, underground pipe storage, and mined underground storage. Truck and tank-car shipments are made at all of these locations.

J. W. BOYD, J. O. RICHARDSON, and **D. A. ROACH,** Phillips Pipe Line Co.

New Techniques and Current Problems in Controlling Underground Corrosion

THIS author will consider improvements and new problems involved with the construction of large-diameter pipe lines. Newer construction has imposed demands on underground corrosion-control measures which require modification of past practices in order to obtain favorable results. Some of these modifications will be discussed.

Lightning causes trouble on underground pipe—especially so in connection with some corrosion-control measures. Some results of methods to cope with this problem will be illustrated. Coatings have long been used to help in the protection of underground pipe against corrosion. Those coatings which give better results on smaller lines in the past are inadequate for the larger lines, and the desirable features of satisfactory coating materials and their application will be enumerated.

O. C. MUDD, Shell Pipe Line Corp.

Fluid Coking of Residua

THIS paper will describe a new refining process which will help conserve United States petroleum resources by making more gasoline and home heating oil from crude oil. The novel process, called fluid cracking, provides oil refiners with a flexible and economical means of accomplishing this desired result. Under development for more than 4 years by the central research and engineering affiliate of Standard Oil Co. (N. J.), the new process is now being installed commercially.

The new process will aid in the exploitation of reserves of very low-grade crude oils which until now could not be economically refined. For the consuming public, fluid coking thus offers new sources of automotive and home fuels because the process converts the low-value crude oil and crude fractions into these more needed products. The fluid-coking process is the latest application of the "fluidized solids" technique originated by S.O.D.C. A fluid-like stream of hot, finely divided coke particles furnishes the heat and surface area required to vaporize and convert the heavy residual fractions of crude oil. The useful lighter products so produced are withdrawn for further processing. Coke is formed in the process. Part of the circulating fluidized coke can be burned to supply the heat needed for the process, but part of it is removed as a byproduct. The byproduct petroleum coke has value as fuel, and may have more valuable applications in the metal-producing industries.

A. VOORHIES, JR., Esso Standard Oil Co., and **H. Z. MARTIN,** Standard Oil Development Co., Linden, N. J.

Trifuel Pipe-Line Engines Demonstrate Advantages

(Continued from page 114)

manner as in the case of the larger eight-cylinder engines on the Borger-Chicago products pipe line. Operating experience with these engines equipped with two spark plugs per cylinder has indicated practically no spark-plug trouble.

Valve timing . . . Because these engines have been operating on a line handling a constant specific gravity fluid, little trouble has been experienced with manual operation of the inlet valve timing; however, additional experience may indicate that it is desirable to install automatic inlet valve timing control.

In comparing the naturally aspirated engines with the supercharged engines, it is significant to note that while both groups of engines are equipped with the variable intake valve timing system, it is not being used to the fullest extent on the naturally aspirated engines. With lighter loads the inlet valve timing is not being further advanced to cut down on the air to the cylinder, as this is being accomplished by throttling with the butterfly valve in the inlet manifold.

Actually, the amount of inlet valve closing advance allowable on the naturally aspirated engines is limited by the fact that further advance will cause overlap between the inlet-valve opening and the exhaust-valve closing and cause poor scavenging and backfiring. This is the case because of mechanical limitations in cam design and not because it would be undesirable in the cycle.

At one of the stations, a delay was experienced in connecting the natural-gas supply, and, as a result, two of these supercharged engines were operated on butane for almost 90 days. These two engines had not been adjusted for butane operation; however, they operated quite satisfactorily but would not carry more than 75 per cent of the full load. No attempt was made to adjust them for higher load-carrying ability.

Conversion characteristics . . . Characteristics for converting from gas to diesel operation are quite good for the engines. To make the change, the spark plugs must be removed and injection nozzles installed in their place. In addition, the push rods for the fuel-injection mechanism which are locked in the up position away from the cam shaft during gas operation must be released and the mechanism connected. Slight adjustments must be made in the inlet valve timing and the impulse generator must be grounded. All these changes can be accomplished in less than 24 hours per engine.

It is contemplated that prior to peak-gas-demand seasons, the engines will be switched from straight gas to dual fuel by making this conversion at some convenient time when the pipe line is not fully loaded. The engines can later be switched from dual fuel to diesel instantly in case of gas curtailment or shutoff.

The engine industry should make an attempt to simplify the conversion from spark-ignition to dual-fuel operation in order to decrease the down time needed for this conversion. The ultimate to be striven for is an engine which can readily be switched from spark-ignited gas fuel to dual fuel or diesel without shutting it down and with a minimum of speed fluctuation.

Cost of Operation

The recorded fuel consumptions determined on the manufacturer's witnessed shop tests show an average of 6,202 B.t.u./b.hp. per hour for the low-pressure supercharged spark-fired engines with variable inlet-valve timing and an average of 6,420 B.t.u./b.hp. per hour for the naturally aspirated spark-fired engines with variable inlet-valve timing. The tests showed an average fuel oil consumption of .370 lb./b.hp. per hour on straight diesel and 6,446 B.t.u./b.hp. per hour on dual fuel (including 5 per cent pilot oil) for low-pressure supercharged engines. All test results shown are for 100 per cent load conditions.

Although pump station facilities are such that fuel-oil consumption can be obtained, the stations are not equipped with gas meters to provide authentic data on gas consumption; however, it is reasonable to assume that the average fuel consumption will not be in excess of 6,500 B.t.u./b.hp. per hour. The cost per horsepower-hour for a given fuel can then be determined. For purposes of comparison, assume a 1,000-hp. load and assume the two fuels to cost 20 cents per 1,000 cu. ft. for 1,000-B.t.u. natural gas, and 10 cents per gallon for 20,000 B.t.u. per pound 36° A.P.I. fuel oil.

Based on the above fuel costs and consumption rates, the cost of operation for an average load of 1,000 hp. would be $11,388 per year for straight gas operation, $13,711 per year for dual-fuel operation, and $42,740 per year for straight diesel operation. This indicates dollar savings of $31,352 per year for straight gas operation over straight diesel, and $2,323 per year for straight gas over dual-fuel. If the gas costs are lower, these savings will increase. It can easily be seen from these costs, that additional investment for an engine for trifuel operation can be justified on an economic basis.

How to get the right packings for your drilling needs

The sure way to do it is to order from *United States Rubber Company's Labeled Line of Rotary Packings* – they are each carefully engineered to fit a specific pump. Each container is carefully labeled so that ordering is easy – with no need to bother about shaft diameters and stuffing box depths. Insist on "U.S." Packings, for a perfectly custom-made product. . . .

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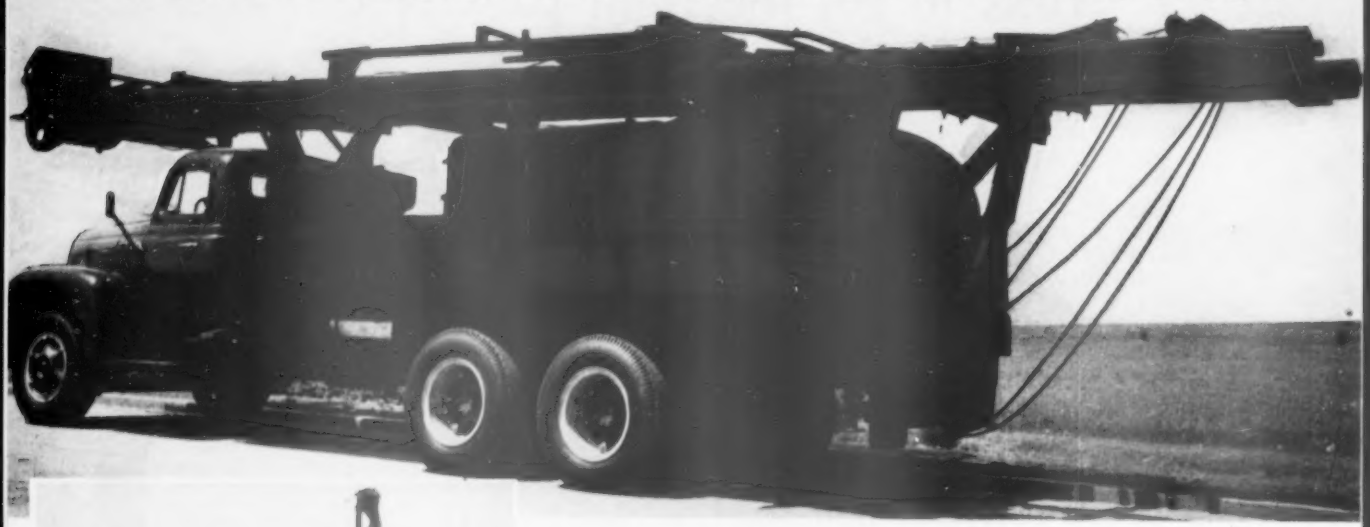
Model E-563 with Choice of Clutches



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Model E-563
2 Drum Spudder tailing-in
a 3,500 ft. well.

Cooper—Allis-Chalmers Model E-563 Rod and Tubing Servicing Winch Units and Double Pitman two or three drum tailing-in Spudder Units.

Air Friction Drum Clutches
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1. Chains run in line at all times.
2. Ball and roller bearings throughout.
3. Big 42″ Dia. x 8″ wide brakes for depths to 6000′.
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4. Patented Air Cooled Brakes with demountable rims.
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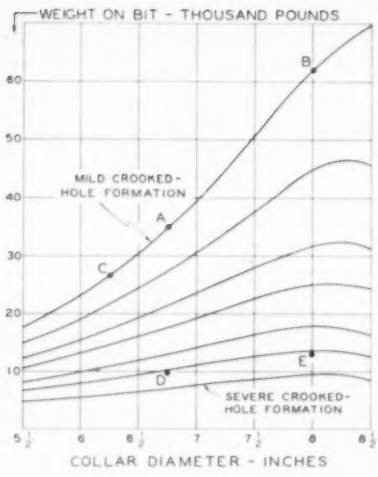

Fig. 1—Effect of drill-collar size on weight on bit to maintain 3° hole inclination in 8¾-in. hole.

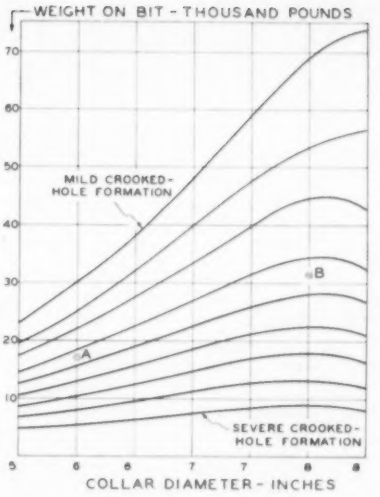

Fig. 2—Effect of drill-collar size on weight on bit to maintain 7° hole inclination in 8¾-in. hole.

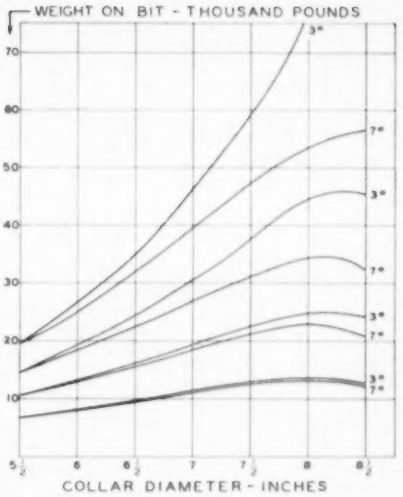

Fig. 3—Effect of drill-collar size on weight on bit to maintain constant hole inclination in 8¾-in. hole.

Effect of Collar Size in CROOKED HOLES

by H. B. Woods

PREDICTING how much additional bit weight may be carried as a result of increasing drill collar diameter is now possible by the use of newly developed charts.* These charts also give an index to how much drilling rate will be increased by carrying more weight and allowing hole deviation to increase from 3° to 7°.

*From data in the paper, "Factors Affecting the Angle of Inclination and Dog-legging in Rotary Bore Holes," by Arthur Lubinski and H. B. Woods. Presented at A.P.I. Mid-Continent spring meeting, Tulsa, March 1953.

Author is with Hughes Tool Co. Paper was presented before A.P.I. Drilling Practice Group, Midland, Tex., Sept. 9, 1953.

Fig. 1 gives the weight on an 8¾-in. bit that will maintain 3° hole inclination for different collar sizes and for different crooked-hole tendencies of the formation. Each curve on Fig. 1 is for a given crooked-hole tendency of the formation. For example, suppose in a particular area it is found from experience that 35,000 lb. weight may be carried with 6¾-in. collars without exceeding a hole angle of 3°. Locate Point A which falls on the upper curve. If 8-in. collars were used in the same formation, the 3° inclination could be maintained with 62,000 lb. as indicated by Point B.

If, however, 6¼-in. collars were used it would be necessary to reduce the weight to 27,000 lb. as indicated by Point C. The curves may be used for 9-in. or other near size bits with negligible error.

In another area it may be necessary to hold the weight to 10,000 lb. to maintain the 3° angle with 6¾-in. collars in 8¾-in. hole as indicated by Point D

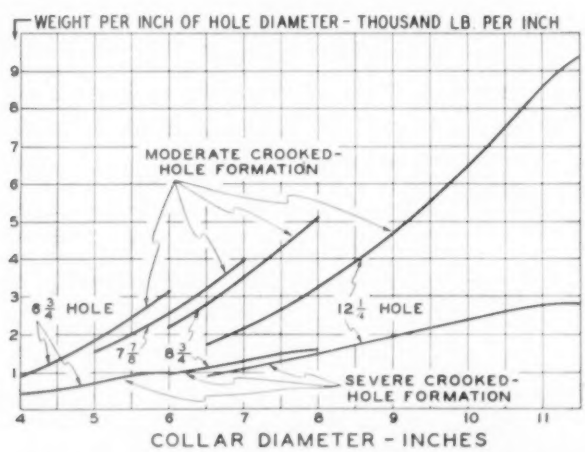
WEIGHT PER INCH OF HOLE DIAMETER - THOUSAND LB PER INCH
MODERATE CROOKED-HOLE FORMATION
SEVERE CROOKED-HOLE FORMATION
COLLAR DIAMETER - INCHES

Fig. 4—Weight per inch of hole diameter to maintain 3° hole inclination for different hole sizes and collar sizes.

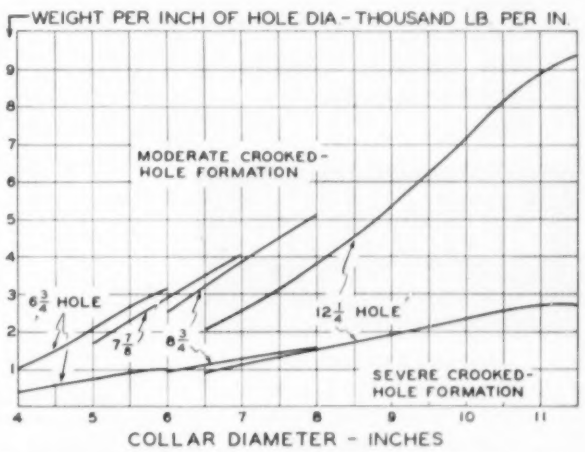
WEIGHT PER INCH OF HOLE DIA - THOUSAND LB PER IN.
MODERATE CROOKED-HOLE FORMATION
SEVERE CROOKED-HOLE FORMATION
COLLAR DIAMETER - INCHES

Fig. 5—Weight per inch of hole diameter to maintain 7° hole inclination for different hole sizes and collar sizes.

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which is slightly below the second curve from the bottom. With 8-in. collars the same hole inclination could be maintained with 13,000 lb. as indicated by Point E.

It may be seen that the percentage increase of weight that may be added on 8-in. collars compared with 6¾-in. is considerably higher in a mild crooked-hole formation than it is in a severe crooked-hole formation. In the first case we were able to increase the weight by 77 per cent, while in the second case by only 30 per cent.

In 7° hole . . . Fig. 2 is similar to Fig. 1 except that it refers to a 7° angle rather than a 3°. It may be seen that the lower curves have about the same shape as the lower curves on Fig. 1. The upper curves, however, are not quite as steep as those on Fig. 1.

In Fig. 3 representative curves from Fig. 1 and Fig. 2 are superimposed to show that a larger collar size does not permit as much increase in weight for maintaining a 7° hole as for maintaining a 3° hole except under very crooked-hole conditions. It must be remembered that the pairs of curves meeting at the vertical axis do not correspond to the same formation. For example, the upper curve is for a formation with which 19,500 lb. on 5½-in. collars will give a 3° hole, and the next curve is for a more severe crooked-hole condition where 19,500 lb. on 5½-in. collars will maintain only a 7° hole.

In Figs. 4 and 5 the weight per inch of hole diameter is plotted against collar diameter for various hole sizes and for moderate and severe crooked-hole formations. Weight per inch of hole diameter is used because this is a measure of drilling rate. For example, if a 3° hole could be maintained with 3,100 lb. per inch on 6-in. collars in a 6¾-in. hole, the same angle could be maintained with 5,100 lb. per inch with 8-in. collars in 8¾-in. hole or 9,000 lb. per inch with 11¼-in. collars in 12¼-in. hole.

In other words the weight per inch of hole diameter could be made 60 per cent greater in an 8¾-in. hole or 190 per cent greater in a 12¼-in. hole as compared to a 6¾-in. hole under mild crooked-hole conditions. It may be seen that this ratio is the same under severe and mild crooked-hole conditions for both 3° and 7° holes.

Effect of formation dip . . . Fig. 6 shows the weight that may be carried to maintain a 7° hole inclination in a given formation compared to the weight required to maintain 3° in this same formation. Actually this varies with the dip of the formation. For example, if 10,000 lb. is required to maintain a 3° hole in a formation which has 45° dip, then a 7° hole may be maintained with 18,000 lb. If, however, 10,000 lb. is required to maintain 3° in a formation in which the dip is only 10°, then a 7° hole may be maintained with 30,000 lb.

SAMPLE PROBLEM . . . In a 9-in. hole where 8,000 lb. on 6-in. drill collars maintains a 3° hole and formation dips at 20°, how much weight can be carried if 8-in. collars are used and inclination is allowed to increase to 7°?

From Fig. 6 it is found that where formation dips of 20° allow only 8,000 lb. to maintain a 3° hole as at Point A, it will allow 17,000 lb. if deviation of 7° is permitted. Then in Fig. 2 it is seen that Point A which represents 17,000 lb. with 6-in. drill collars corresponds to 31,000 lb. on 8-in. collars at Point B. Therefore, 31,000 lb. may be carried on the bit if 8-in. drill collars were used and 7° drift is maintained.

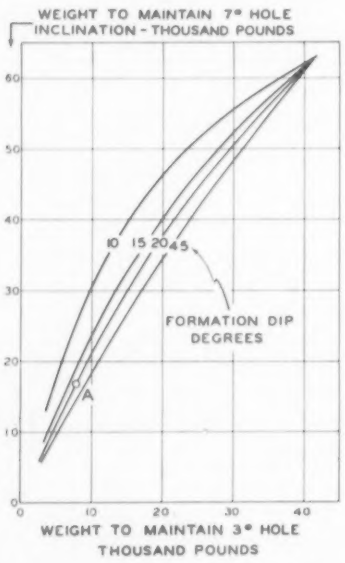

Fig. 6—Comparison of weights to maintain 3° and 7° hole inclination for 6¼ collars in 8¾-in. hole formation dips as indicated.

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REEF FIELDS GASOLINE CORPORATION operates this compressor station in Hobo Field, Texas. But operation does not require a full time attendant — it requires only periodic inspections by field personnel who live several miles away at another field. For these Beaird-Ingersoll-Rand packaged compressor plants are equipped with special controls which make a regular attendant unnecessary. Automatic speed and pressure regulators on their flexible 4-cycle engines, increase or decrease speed to handle the fluctuating volume of gas. And automatic shut-down devices stand guard to protect the units against damage from any unusual operating conditions which might develop.

These automatic controls are but a few of the many advantages of Beaird-Ingersoll-Rand packaged compressor plants. Let us tell you all the facts.

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ANHYDROUS AMMONIA EQUIPMENT

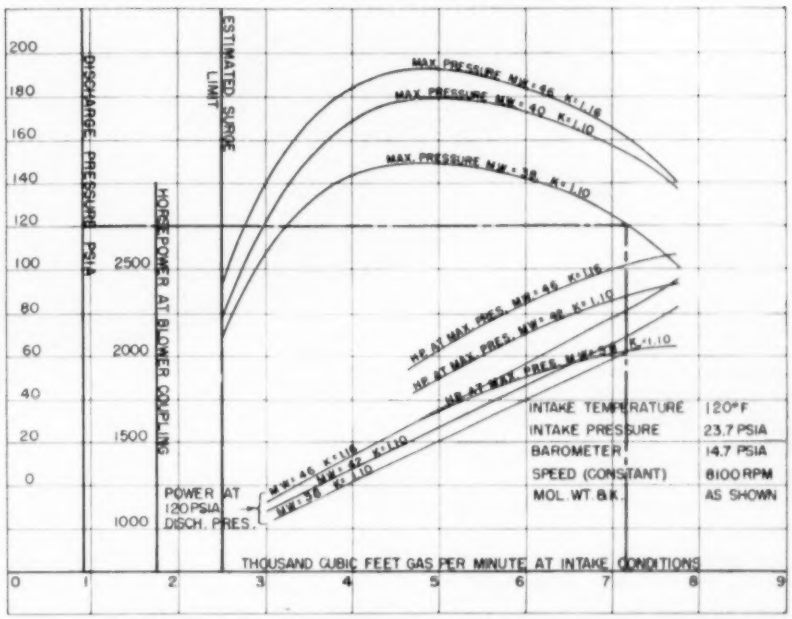
LP-GAS SYSTEMS

Refinery Centrifugal Compressor Performance—2

by H. C. Mayo

THE two charts presented here show characteristic curves for constant-speed electric-motor-driven centrifugal compressors with movable inlet guide vanes and power wheels used as main air blower and gas compressor, respectively. See also the three charts given in the preceding installment.

Author is equipment engineer, M. W. Kellogg Co. See article, "Driving the Cat Cracker Blower . . ." by H. C. Mayo, The Oil and Gas Journal, Sept. 7, 1953, p. 86.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ESTIMATED SURGE LIMIT
HORSEPOWER AT BLOWER COUPLING
MAX. PRESSURE MW=46 K=1.18
MAX. PRESSURE MW=40 K=1.10
MAX. PRESSURE MW=38 K=1.10
HP AT MAX. PRES. MW=46 K=1.18
HP AT MAX. PRES. MW=40 K=1.10
HP AT MAX. PRES. MW=38 K=1.10
POWER AT 120 PSIA DISCH. PRES.
MW=46 K=1.18
MW=42 K=1.10
MW=38 K=1.10
INTAKE TEMPERATURE 120°F
INTAKE PRESSURE 23.7 PSIA
BAROMETER 14.7 PSIA
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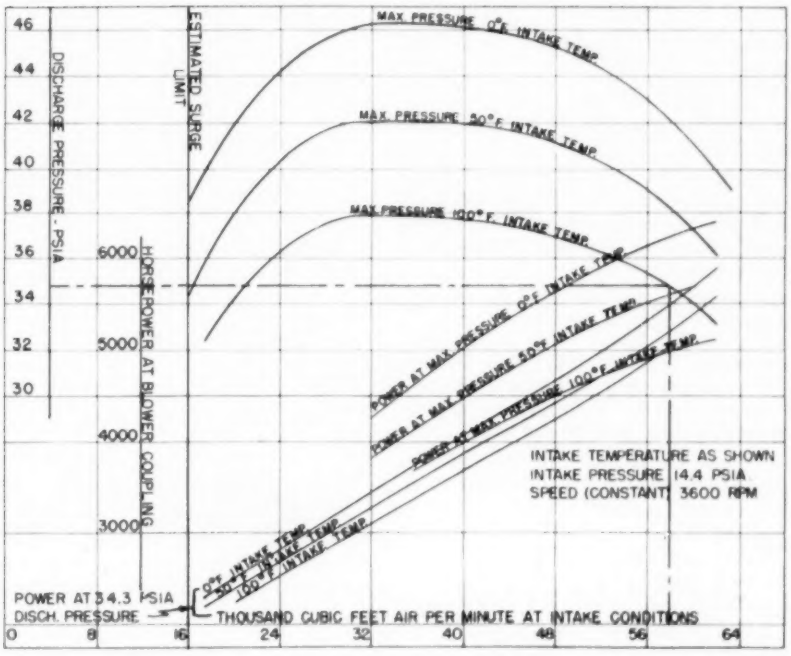
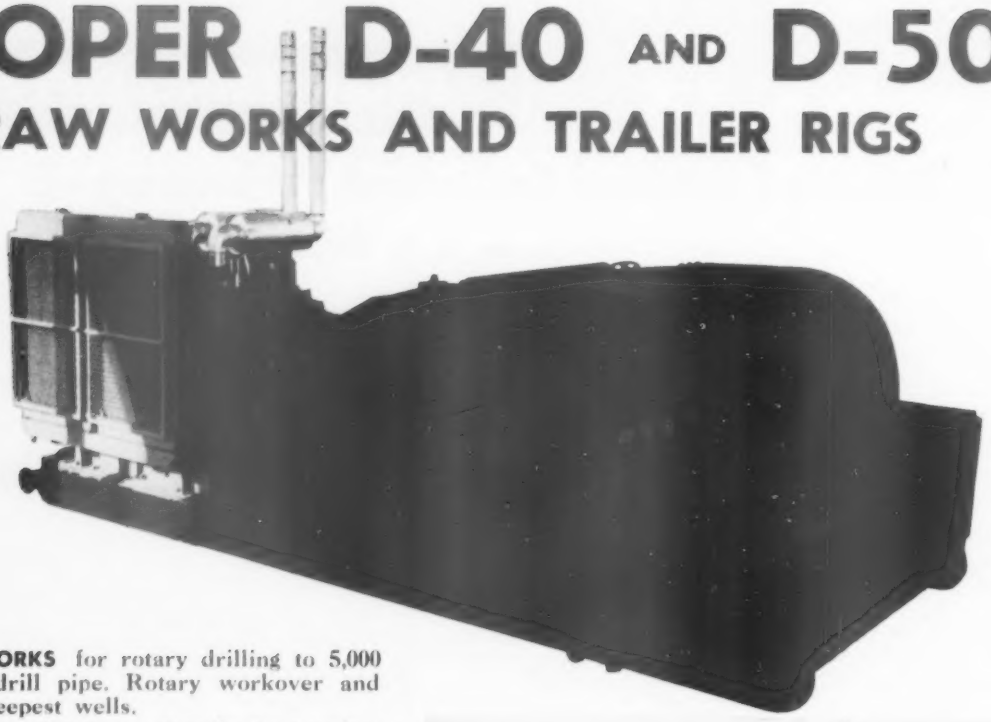
THOUSAND CUBIC FEET GAS PER MINUTE AT INTAKE CONDITIONS

Characteristic curves for five-stage, constant-speed centrifugal gas compressors with first-stage adjustable guide vanes and power wheel.


DISCHARGE PRESSURE - PSIA
ESTIMATED SURGE LIMIT
HORSEPOWER AT BLOWER COUPLING
MAX. PRESSURE 0°F. INTAKE TEMP.
MAX. PRESSURE 50°F. INTAKE TEMP.
MAX. PRESSURE 100°F. INTAKE TEMP.
POWER AT MAX. PRESSURE 0°F INTAKE TEMP.
POWER AT MAX. PRESSURE 50°F INTAKE TEMP.
POWER AT MAX. PRESSURE 100°F. INTAKE TEMP.
INTAKE TEMPERATURE AS SHOWN
INTAKE PRESSURE 14.4 PSIA
SPEED (CONSTANT) 3600 RPM
0°F INTAKE TEMP.
50°F INTAKE TEMP.
100°F INTAKE TEMP.
POWER AT 34.3 PSIA DISCH. PRESSURE
THOUSAND CUBIC FEET AIR PER MINUTE AT INTAKE CONDITIONS

Characteristic curves for four-stage, constant-speed centrifugal air compressors with first-stage guide vanes and power wheel.

COOPER D-40 AND D-50
DRAW WORKS AND TRAILER RIGS



D-50 DRAW WORKS for rotary drilling to 5,000 ft. with 4½" drill pipe. Rotary workover and servicing the deepest wells.

Brakes: 52" dia. x 10" face to handle the heaviest loads safely.

Powered by diesel or gas engine up to 400 horsepower.

D-40 DRAW WORKS for rotary drilling to 4,500 ft. with 4½" drill pipe. Servicing and rotary workover to 10,000 feet.

Brakes: 42" dia. x 8" face.

Powered by diesel or gas engine up to 300 horsepower.

These modern rigs are similar in design. *Both* have—

Torque Converter drives,

Oil Bath multiple strand roller chain drive to countershaft,

Torqmatic three-speed and reverse transmission that can be shifted under full load and at full speed, instantly, without slowing, declutching or in any way losing time in shifting gears.

Air Friction Clutches in drums. Single drum or double drum models.

These units mounted as trailer rigs with heavy, two pole, telescoping masts are exceptionally fast to move and set up on the job. Tubing boards and rod hangers automatically go into place when mast is telescoped.

Cooper D-50 trailer rig with 91 ft. extra heavy two pole telescoping mast, tubing board and rod hangers on a 10,000 foot well.

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ELECTRIC LOGGING—13

Effects of the Mud Filtrate

by R. I. Martin

THE lower part of Fig. 1 of Installment 12 shows the resistivity distributions likely to be present in a bore hole. Mud resistivity of 1 ohm-m (R_M) is shown as a horizontal line across one-half of the bore hole. Normally the resistivity of the mud cake R_{MC} is approximately twice the mud resistivity. This is shown by the short line R_{MC} opposite the thickness of the mud cake. The next step is the resistivity of the invaded zone directly behind the mud cake.

Assuming that the connate water has been flushed completely the resistivity may be obtained from the equation

$$R_{XO} = F\,(R_{MF})$$

where:

R_{XO} = resistivity of invaded zone
F = formation factor
R_{MF} = resistivity of mud filtrate

The change in resistivity after this may take many forms depending on both the true resistivity of the uncontaminated formation (R_T) and the extent of invasion.

The lower curve shows in approximate form a decrease from the value R_{XO} to the value Rt of 0.5 ohm-m for a salt-water sand. No abrupt changes in resistivity can occur because the variable displacement of connate water is progressive. The relation between the extent of the invaded zone in the upper part of the figure and this transition can be seen. If invasion were more extensive, the resistivity R_{XO} would continue as a horizontal line until the transition zone was reached. The radial length of the transition zone is usually constant regardless of the extent of invasion because of the mechanics of flushing. If, for example, the displacement is effective in 2 ft., the transition zone will be 2 ft. in length regardless of whether it is 3 ft. or 10 ft. from the wall of the hole. Hence the diameter of the invaded zone has a more definite physical significance when invasion is large.

The upper curve in Fig. 1 of Installment 12 shows a possible condition if the sand is oil bearing. In this case the value R_{XO} is higher because of the residual oil saturation. A transition zone occurs between this value and that of the uncontaminated formation (R_T = 20 ohm-m). In this case the invaded part of the oil sand has a lower resistivity than the uncontaminated part.

An alternative case which may be encountered in practice would occur if Rt had a value of perhaps 7 ohm-m. In this case the resistivity of the invaded zone would be higher than the true resistivity.

As these results are completely different it is essential to recognize that they may occur as stated, depending on the particular resistivity relationships involved.

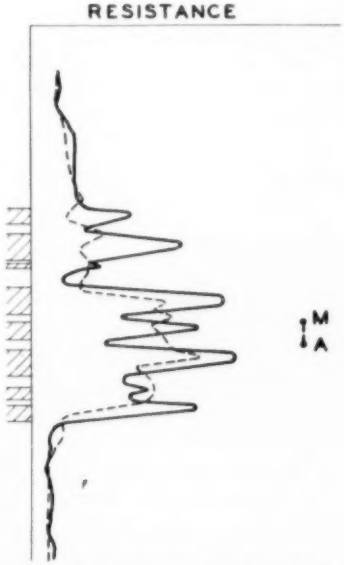

Fig. 1—Monoelectrode curve (solid line) versus two-electrode curve (broken line). From "Electric Well Logging," a copyrighted manual by Herbert Guyod.

The extent of invasion varies within wide limits. In many cases the extent is so small that it has little effect on electric logs. In extreme cases it may be many feet, although in the majority of areas it is usually less than 7 ft.

Because an invaded zone is usually present, and has a resistivity which may be quite different from that of the true resistivity, its effect on two-electrode logs should be considered. A short spacing will measure the resistivity of the invaded zone and also the mud resistivity. This value will be different from that which would be found if it measured the true resistivity and also the mud resistivity. A larger spacing, such as the long normal, will be affected by a greater volume of material, and may often measure a resistivity which is not too different from the true resistivity.

There is a practical limit to which the length of a two-electrode device may be increased. As the spacing is increased, the number of beds which are equal to or less than the critical spacing becomes greater. The true resistivity of such beds cannot be approximated, and so the log decreases in value.

Fig. 1 shows this effect. The solid line is the log obtained with a monoelectrode and has been used to establish the boundaries of the beds shown. In contrast to this, the two-electrode curve, shown by the broken line, is much less satisfactory. Low resistivities opposite the upper two beds should be noted. The lower section presents a confused picture as far as detailed lithology is concerned, although there is little doubt that it is more resistant than the surrounding shales. A smaller spacing would give a clearer indication of lithology. This figure might also be considered as a comparison of the long normal with the short normal.

Consequently another device is used which, although having a longer spacing, actually gives better results on thin beds than the two-electrode device. This other electrode arrangement is a three-electrode device which gives the curve known as the lateral curve on Schlumberger logs.

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

Performance of Special-Design Valve

by C. F. Woods*

THE special design valve discussed in Instalment 3 of this series has been applied for high-pressure natural-gas service in: (1) Back-pressure control on fixed-bed dehydration plants where large volumes are involved, and (2) pressure-regulating service on large-volume lines.

1. Back-Pressure Control—Fixed-Bed Dehydration Units

Back-pressure control valves are installed on dehydration units for the purpose of getting the maximum capacity through the units. In order to reduce horsepower requirements it is desirable that such valves offer minimum pressure drop at peak conditions.

For large-volume flows, 50 million cubic feet per day and up, in pressure ranges around 1,000 psig., the construction of such valves becomes an extremely important consideration.

In a conventional double-ported valve, where one port is naturally larger than the other, the difference in area causes an unbalanced force of considerable magnitude. For example, a 12-in. valve has an area difference of 1.92 sq. in. Add this to a stem area of 0.69 sq. in. and you have a total area of 2.61 sq. in. With a 1,000-psi. differential across the valve, the force required to offset this difference is 2,610 psi. Tests have shown that the attendant dynamic unbalance is usually greater than this figure, and must be added to it.

Although the valves for such back-pressure service are usually handling very small pressure drops, it is only proper that they be designed and built to stand full line pressure drop, if required on emergency, without damage to themselves, or the line. In the past, design engineers have wisely selected smaller valves, using a parallel hookup for required volume, because the larger valves were either not suitable for the service, or because they were not available in the sizes required, or both.

The special-design pipe-line valve presented here will meet the requirements. An examination of some of the economics of such installations may be in order. Obviously, one will want the valve to have as low a pressure drop as possible when in the open position with capacity flow through new desiccant beds. Fig. 1 shows the horsepower increase versus pressure drop to be in the order of 35 hp. per 5-lb. increase, or about 7 hp. per 1-lb. increase, over the base design drop of 25 lb. through the unit. Fig. 2 shows the pressure drops for various rates of flow at 1,000 psig. for different-size valves. Referring to Fig. 2 gas engineers may, by establishing the prices of the valves, determine what payout will obtain by increasing the size one or two increments.

2. Pressure-Regulating Service

As throughputs increase, valve-size requirements get larger and larger, and with conventional valves the power demands get out of hand. Although large power demands can be met, and have been, the attendant costs of such units are naturally quite high. Therefore, where tight shutoffs are not required, it seems logical to use a valve design whose power requirements can be met with conventional diaphragm operators.

By installing the valve with the incoming flow directed around the web the entire body is filled with the warmer gas. The downstream gas must expand away from the valve body — downstream — and there is little likelihood of freezing up the packing gland.

Although only two typical services have been outlined, there is basically no reason why this design cannot be applied to flow control of large lines, and to any pressure-regulating service where tight shutoff is not required. Although primarily designed as a big-inch valve, it should work equally well in the smaller sizes.

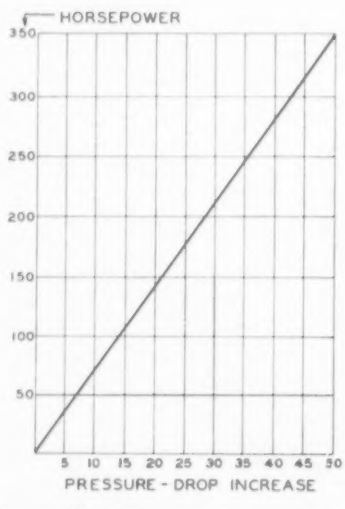

Fig. 1—Horsepower increase vs. pressure-drop increase for dehydration-unit application, using 25-psi. as base, compressing 100 M.M.c.f. per 24 hours from 475 to 875 psig.

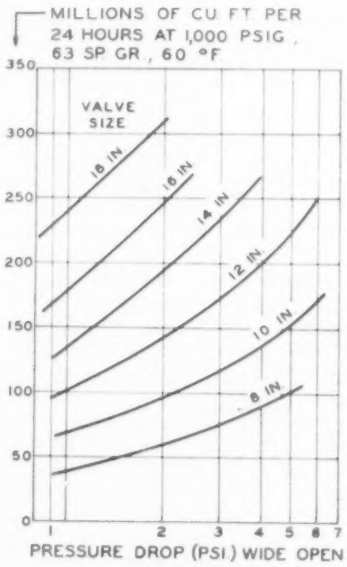

Fig. 2—Pressure drop for various rates of flow. (Horsepower increase approximately 7 hp. per pound).

*Minneapolis-Honeywell Regulator Co., Dallas. Portion of paper presented at A.S.M.E. Kansas City meeting.

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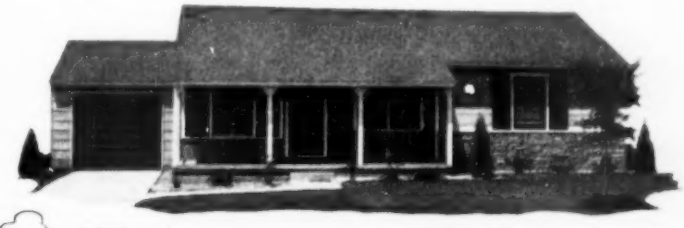

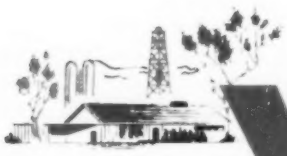

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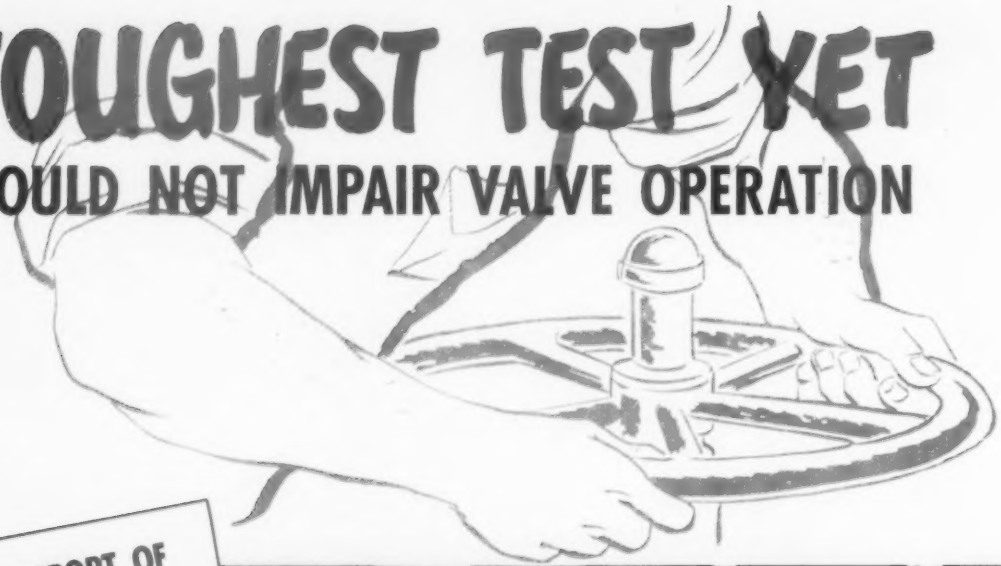

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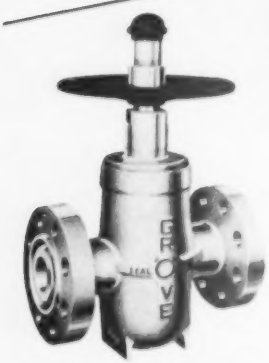

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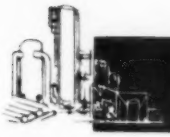

FIELD PROCESSING

NATURAL GASOLINE . . . REFINING

- A new Journal feature, the Field Processing page, is introduced here.
- This is designed for the needs of those engaged in natural gas-gasoline processing and other industry personnel who may be interested.
- The first series to be run on this page presents the California Research Corp. method for calculating absorbers.

How to Design and Evaluate Absorbers—1

by R. J. Hull* and K. Raymond*

THIS paper presents an accurate method for calculation of component yields and temperature conditions in ordinary nonintercooled, nonreboiled light-hydrocarbon absorbers. In the natural-gas processing industry, many calculation methods have been applied to operating absorbers, but the evaluations too frequently are inconsistent and illogical and leave doubt as to whether the data, the equipment operation, or the evaluation method itself is in error. The present method is supported by a large amount of operating data covering wide ranges of pressure, temperature, lean-oil molecular weight, gas composition, and absorption factor.

Kremser-Brown Method

Since the advent in the early twenties of the oil-absorption process for recovery of natural-gasoline components from natural gas, the design and evaluation of absorbers has received considerable attention. The first significant contribution to the problem was in 1930. At this time Kremser[1] introduced a method that used the concept of "Absorption Factor" based on Raoult's law. In 1932, Souders and Brown[2] modified Kremser's method by using absorption factors based on equilibrium constants.

Rich gases, high pressures . . . The modified method is popularly known as the Kremser-Brown method and has been used widely throughout the petroleum industry to design absorbers. In the derivation of the method it was assumed that the pressure, temperature, and quantities of oil and gas throughout the column were constant. These assumptions, while sufficiently valid for the then-prevailing low absorption pressures, led to serious errors in the design of higher-pressure absorbers, particularly those treating rich gases where a relatively large fraction of the rich gas is absorbed.

Effective Absorption Factor

In 1940, Horton and Franklin[3] derived an exact equation for the fraction of component absorbed in terms of individual absorption factors on each plate. In order to obtain the factors on each plate they assumed that per cent absorption on each plate throughout the absorber was constant and that the temperature change was proportional to the gas contraction (shrinkage) across the tray. Although the predicted material balances and temperatures on each plate may differ considerably from those actually obtained in a given absorber, it is claimed that the over-all component absorption agrees closely with plate-to-plate calculations.

Alternative method . . . Horton and Franklin also presented an alternative method that simplified the use of individual absorption factors by employing the concept of an effective absorption factor for each component. The effective absorption factors are evaluated at different plates in the column depending upon the value of the absorption factor for the component in question.

Edmister modification . . . More recently, Edmister[4] presented a modification of the Horton and Franklin method. Edmister derived expressions for the effective absorption factors in terms of the absorption factors at the top and bottom of the column based on the assumption of a two-tray absorber.

The above-mentioned absorber design methods consist primarily of derivations of component material balance expressions in terms of absorption factors. The evaluations of the absorption factors, while adequate for some situations, are based on assumptions which are not necessarily consistent with conditions in actual absorbers. To be of full practical value, a method should include means of evaluating absorption factors in terms of actual absorber conditions.

How this may be done will be shown in the installments to follow. The information to be presented will deal with an improved absorber design and evaluation procedure, including: (1) empirical design correlations based on actual absorber data, and (2) the best available equilibrium and thermodynamic data.

*California Research Corp., Richmond, Calif. Paper presented at California Natural Gasoline Association meeting, Los Angeles, October 8-9.

References

1. Kremser, A., Nat'l. Petroleum News, 22, No. 21 (1930).
2. Souders, M. and Brown, G. G., Ind. Eng. Chem. 24, 519 (1932).
3. Horton, G. and Franklin, W. B., Ind. Eng. Chem., 32, 1384 (1940).
4. Edmister, W. C., Ind. Eng. Chem. 35, 837-9 (1943).

PROGRESS IN METALS

Alphabetical List of Some of the More Common Refinery Alloys and Steels

Part 3

by W. L. Nelson
Technical Editor

(A similar listing, alphabetized according to service or equipment will be published later)

Material	Outstanding service	Chemical composition, per cent§								
		Fe	C	Cr	Ni	Mo	Mn	Cu	Si	Others
Lead (available as clad plate):										
Chemical	Dilute sulfuric acid				(Ag 0.02)			0.4-0.8		‡99.9 Pb
Antimonial or hard	Dilute sulfuric acid				(rest mainly Pb)					6.0-12.0 Sb
Acid	Dilute sulfuric acid				(Ag 0.002)			0.04-0.08		‡99.9 Pb
Low-alloy steels	(See steels, low alloy)									
Low temperature	(See steels, low temperature, etc.)									
Meehanite (iron)	Convection supports to 900° F.		3.0	0.5-1.0					1.0-1.4	
Monel metal (available as clad plate):										
Regular monel	Severe "acid"-"sulfide"	1.4	0.15		30.0		1.0	67.0	0.1	
H monel (castings)	corrosion below 450°	1.5	0.1		29.5		0.9	65.0	3.0	
S monel (castings)	F., exchanger and tower shells, bubble plates, etc.	2.0	0.1		30.0		0.9	63.0	4.0	
K monel	Strength and hardness	0.9	0.15		29.0		0.4	66.0	0.25	2.75 Al
Muntz metal	Exchanger tube sheets*							60.0		40.0 Zn
Naval brass					(39.0 Zn)			60.0		1.0 Sn
Hi-hard iron	Wear resistance		0.1	1.5	4.5	0.5			0.5	
Nichrome	Scales at 1,900°-2,000° F.	15.0		15.0	60.0					
Nichrome IV	Scales at 2,000°-2,100° F.			20.0	80.0					
Nickel (available as clad plate)	Corrosion and low temperature	0.15	0.1		99.4		0.2	0.1	0.05	
Nickel (available as clad plate)	Low temperature	(Maximum carbon 0.02%)								
Nickel chromium molybdenum alloys:										
(See Worthite, Circle L-34, etc.)		rest	‡0.07	19.0-20.0	24.0-30.0	3.0-3.5	0.6-2.0	2.0-4.0	1.0-3.0	
(See Hastelloys A and C, Contracid, etc.)		1.0-20.0		14.0-25.0	58.0-65.0	3.0-20				2.0-10.0W
Nickel silvers	Instruments, etc.				18.0			60.0-64.0		18.0-32.0Zn
Ni-resist cast iron	"Acid"-"sulfide" corrosion		2.9	2.0	15.0		1.1	6.0	2.0	
Silicon iron	(See Duriron)									
Silicon molybdenum irons	(See Durichlor)									
Silver (available as clad plate)	extreme hydrochloric acid corrosion									
Steels, corrosion resistant (see steels, furnace; stainless, etc.)										
Steels, furnace tubes:										
Killed carbon		rest	0.18				0.6		0.2	
Carbon moly	High temp. strength	rest	0.15			0.5	0.5		‡0.25	
Silicon moly (Silmo)	High temp. strength	rest	0.15			0.5	0.5		1.4	
1¼ Chromium, silicon moly	High temp. strength	rest	‡0.15	1.25		0.5	0.5		1.0	
2 Chromium moly	High temp. strength	rest	‡0.15	2.0		0.5	0.5		0.3	
2 Chromium silicon moly	Mildly corrosion resistant	rest	‡0.15	2.0		0.5	0.5		1.25	
5 Chromium moly	Mildly corrosion resistant	rest	‡0.15	5.0		0.5	0.5		‡0.5	
5 Chromium silicon moly	Mildly corrosion resistant	rest	‡0.15	5.0		0.5	0.5		1.5	
7 Chromium moly	Corrosion resistant	rest	‡0.15	7.0		0.5	0.5		‡0.5	
9 Chromium moly	Corrosion resistant	rest	‡0.15	9.0		1.0	0.5		‡0.5	
Stainless (see Types 304, 310, 316, 317, 321, 347, etc.)										
Steels, furnace castings:										
Gray cast iron	To 600° F. insulated		3.2						1.5-2.0	
Meehanite iron	To 900° F. convection		3.0	0.5-1.0					1.0-1.4	
Nickel chromium iron	To 1,000° F. convection		3.2	0.5-0.75	1.0-4.0				1.2-2.7	
Scale-resisting iron	To 1,300° F. convection		2.6-3.0		12.0-15.0				1.2-2.2	
Ni-resist iron	To 1,400° F. convection		3.0	3.3	14.3			5.3	1.6	
HD 28-5 steel	To 1,900° F. radiant	rest	‡0.5	26.0-30.0	4.0-7.0		‡1.5		2.0	
HE 29-9 steel	To 1,950° F. radiant	rest	0.2-0.5	26.0-30.0	8.0-11.0		‡2.0		2.0	
HH 25-12 steel	To 2,000° F. radiant	rest	0.2-0.5	24.0-28.0	11.0-14.0		‡2.0		2.0	
HK 25-20 steel	To 2,050° F. radiant	rest	0.2-0.6	24.0-28.0	18.0-22.0		‡2.0		3.0	
HL 30-20 steel	To 2,100° F. radiant	rest	0.2-0.6	28.0-32.0	18.0-22.0		‡2.0		3.0	
HF 20-10 steel	To 1,800° F. radiant	rest	0.2-0.4	18.0-23.0	8.0-12.0		‡2.0		2.0	
HC 28 steel	To 1,600° F. radiant	rest	‡0.5	26.0-30.0	‡4.0		‡1.0		2.0	
Nichrome	To 2,000° F. radiant	15.0		15.0	60.0					
Nichrome IV	To 2,100° F. radiant			20.0	80.0					

*Resistance to dezincification improved if inhibited with arsenic (0.02-0.2 per cent) or antimony. ‡Maximum. ‡Minimum. §A blank does not necessarily mean zero or absent—it may mean that information is not available. The meanings of the symbols are: Fe, iron; C, carbon; Cr, chromium; Ni, nickel; Mo, molybdenum; Mn, manganese; Cu, copper; Zn, zinc; Sn, tin; Al, aluminum; Mg, magnesium; W, tungsten; Si, silicon; Sb, antimony; Va, vanadium; Ti, titanium; Pb, lead; Ag, silver; and Cb, columbium.

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Birmingham—Elec. Repair & Serv. Co.
Greenville—Mowbray Eng. Co.
Montgomery—Standard Electric Co.

ARIZONA
Bisbee—Copper Electric Co. Inc.
Phoenix—Daley Electric Company

CALIFORNIA
San Diego—Calif. Elec. Works
Los Angeles—Larsen-Hogue Elec. Co.
Oakland—Pacific Elec. Motor Co.
T. L. Rosenberg Co.
San Francisco—Weidenthal-Gostiner Electric Works

COLORADO
Denver—Baker Electric Company

CONNECTICUT
Hartford—Charles H. Leppert
Waterbury—Elec. Motor Repair Co., Inc.

FLORIDA
Jacksonville—Turner Electric Works
Miami—Peninsular Armature Works
Tampa—Tampa Armature Works, Inc.

GEORGIA
Albany—Georgia Electric Co.
Atlanta—Bearden-Thompson Elec. Co.
Columbus—Smith-Gray Electric Co.

ILLINOIS
Chicago—Chicago Electric Co.
Marion—Giles Arm. & Elec. Wks., Inc.
Mt. Vernon—Dowzer Electric Machinery Works, Inc.

INDIANA
Indianapolis—Scherer Electric Co., Inc.
Evansville—Evansville Elec. & Mfg. Co.

IOWA
Sioux City—Smith Elec. & Supply Co.

KANSAS
Salina—Cent. Kans. Elec. Mach. Co.
Wichita—Tarrant Electric Mach. Co.

LOUISIANA
New Orleans—Industrial Elec., Inc.
Shreveport—Shreveport Armature & Electric Works

MAINE
Brewer—Stanley J. Leen Co.

MARYLAND
Baltimore—Keystone Electric Co., Inc.

MASSACHUSETTS
Lawrence—Roland B. Gilnes Co.
Springfield—Elec. Motor Repair Co.

MICHIGAN
Detroit—Stecker Electric Company
Grand Rapids—Grand Rapids Industrial Electric Co.
Saginaw—Banning Elect. Prod. Corp.

MINNESOTA
Duluth—Mielke Electric Works, Inc.
Minneapolis—Parsons Elec. Co.

MISSISSIPPI
Vicksburg—Ludke Electric Co., Inc.

MISSOURI
Kansas City—Boese-Hilburn Elec. Co.
St. Louis—French-Gerleman Elec. Co.
Springfield—Springfield Elec. Serv. Co.

NEBRASKA
Omaha—Omaha Electrical Works

NEW HAMPSHIRE
Concord—A. S. Tracy

NEW JERSEY
Atlantic City—Charles A. Buckley
Paterson—Elec. Service Repair Co.
Trenton—Lockwood Elec. Motor Serv.

NEW MEXICO
Albuquerque—Electric Motor Company
Powell Electric Co.

NEW YORK
Buffalo—Robertson Electric Co.
Volland Elec. Equip. Co., Inc.
Flushing—Flushing Elec. Corp.
Jamestown—A. E. Westburgh
Mt. Vernon—H. A. Schreck, Inc.
New York—Consol. Elec. Motor Co.
Rochester—Vanderlinde Elec. Corp.
Utica—Mather, Evans & Diehl Co.
Watertown—Watertown Elec., Inc.

NORTH CAROLINA
Charlotte—Southern Elec. Service Co.
Greensboro—Southern Elec. Serv. Co.
Rocky Mount—Hammond Elec. Co.

OHIO
Cincinnati—Cincinnati Elec. Equip. Electric Service Co.
Akron—A-C Supply Co.
Toledo—Ramanoff Elec. Motor Serv.
Youngstown—Winkle Electric Co.

OKLAHOMA
Miami—Miami Armature Works
Oklahoma City—Southwest Elec. Co.
Tulsa—Smith-Milligan Electric Co.

OREGON
Eugene—Kalen Electric & Mach. Co.
Portland—Milwaukee Mach. Co.

PENNSYLVANIA
Johnstown—Universal Elec. Mfg. Co.
Osceola Mills—Mid-State Elec. Eng. Co.
Philadelphia—Elec. App. & Repair Co.
Pittsburgh—Penn. Elec. Coil Corp.
York—Industrial Electric Company

SOUTH CAROLINA
Greenville—Southern Elec. Serv. Co.
Spartanburg—Southern Elec. Serv. Co.

SOUTH DAKOTA
Sioux Falls—Electric Motor Repair

TENNESSEE
Columbia—Middle Tenn. Arm. Wks.
LaFollette—Standard Arm. Works, Inc.
Memphis—Indus. Elec. & Supply Co.

TEXAS
Amarillo—G. E. Jones Elec. Co.
Beaumont—Elec. Mach. & Repair Co.
Dallas—Industrial Elec. Equipment Co.
El Paso—B & M Machinery Co.
Fort Worth—Central Electric Co.
Houston—Roy A. Berentz Co.
Sweetwater—Sweetwater Electric Co.

UTAH
Salt Lake City—Diamond Electric Motor Repair

VIRGINIA
Richmond—Wingfield & Hundley
Roanoke—Virginia Armature Co.

WASHINGTON
Spokane—Lee F. Austin Company

WEST VIRGINIA
Charleston—Charleston Elec. Supply
Fairmont—West Virginia Armature Co. of Fairmont, Inc.
Morgantown—Galis Elec. Repair Co.

WISCONSIN
Baraboo—Utility Trans. & Equip. Co.
Green Bay—Boemster Electric Co.
Milwaukee—Dietz Electric Co.
Wausau—Electric Motor Service
Wisconsin Rapids—Staub's Elec. Wks.

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***TEXROPE* — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.**

PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

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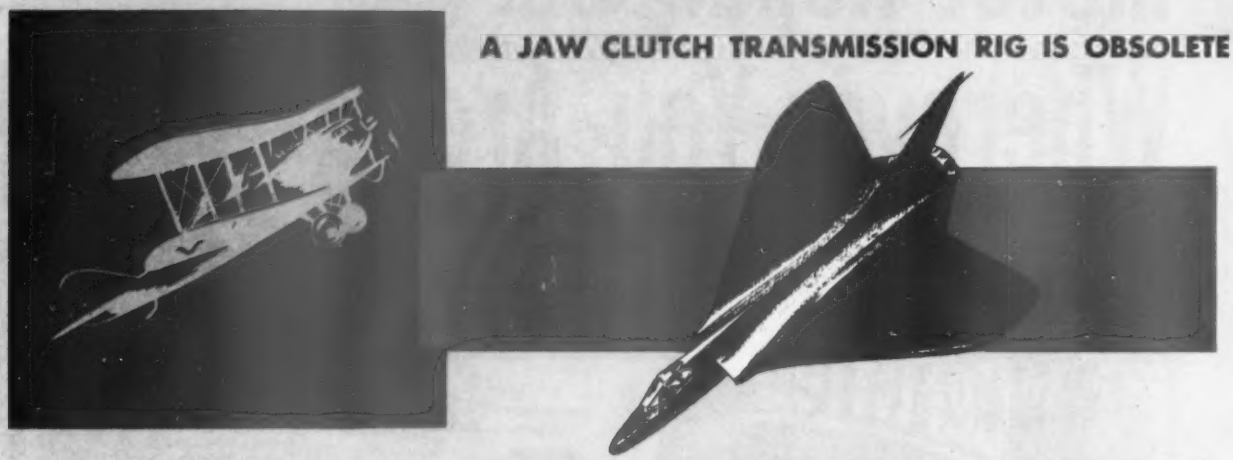
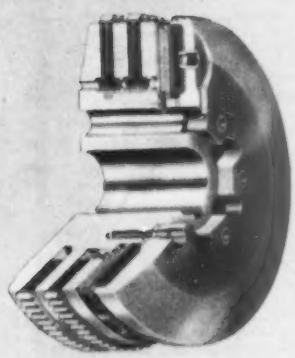


A JAW CLUTCH TRANSMISSION RIG IS OBSOLETE

BE MODERN-BUY WILSON!



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ATLAS ROADAIR RIG

Get up-to-date. Don't worry with jaw clutches or friction clutches that need cleaning. Use Wilson Rigs with Air-Tube Disc Clutches in the compound, transmission and drum drives. Yes . . . Be Modern — Buy Wilson!

Wilson

The FIRST NAME in DRILLING RIGS!

WILSON MANUFACTURING CO., Inc.

WICHITA FALLS, TEXAS, U.S.A.

Drill-Stem Tests—2

THE oil spillage often accompanying a drill-stem test and the danger inherent with it are considered by some a necessary risk. However, this hazard can be and should be minimized. The use of drill-stem test plugs is a simple and inexpensive answer.

A. Installations—These plugs can be either machined or welded. An economical way is the use of old tool joint pins from joints of drill pipe that has been twisted off or junked in the course of drilling.

To make the plugs, the following procedure should be followed:

1. Blank the top of two old drill pipe pins, above the tool joint threads.

2. Install a ¾-in. bar horizontally across top of pin, long enough to extend beyond the elevator bails.

3. Weld an eye in top of pin to be used to hook into with a spring connection.

4. Install casing spring to hook on traveling blocks with snap hook securely fastened on lower and extending down to within 3 in. of eye in top of plug.

Having made the plugs and installed spring, the following steps are taken as the drill pipe is pulled from the well bore, after drill-stem test tool has been open and now closed to pull out of hole.

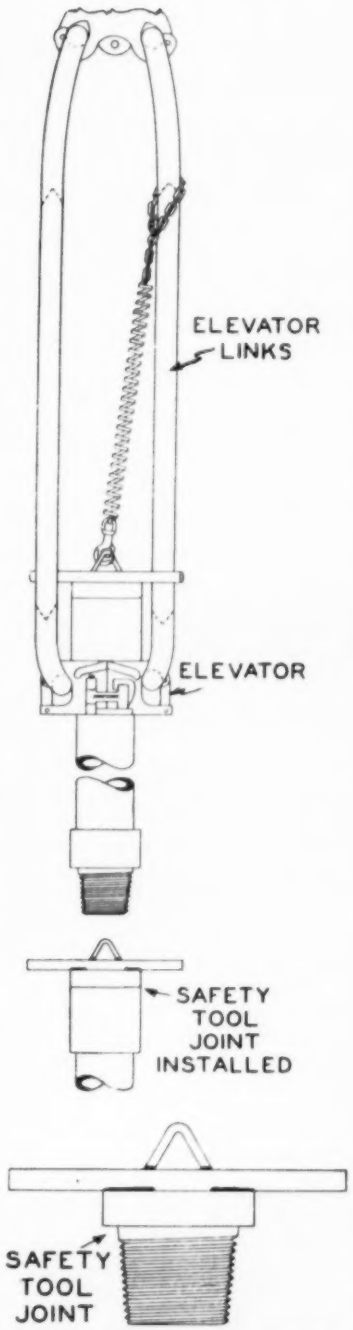
1. Plug is screwed into top of drill pipe in hole, elevators latched around pipe and snap on end of casing spring attached to eye in top of plug.

2. Stand is pulled, joint broke with tongs and mud box installed.

3. Stand is then rotated out, all excess gas and oil going out drain from mud box to line laid to reserve pit, and well has stopped heading or flowing.

4. Mud box is then removed and stand set back into box above rotary table, where it is again rotated to the right until plug is backed out on top of stand. When plug on top of stand is backed out, it will jump clear of box being suspended on casing spring and it will swing clear of stand being set back.

Courtesy of A.A.O.D.C.



Oil spillage during drill-stem tests can be minimized with these plugs.

5. The second plug is then installed to box at rotary table to keep any additional heading of well through drill pipe, while stand is being set back and blocks lowered to the floor.

6. Blocks being lowered to the floor, the first plug is removed and snap-on spring is attached to the second plug to be pulled as above described. This procedure is followed throughout the removal of the drill pipe from the hole after a drill-stem test.

Using these drill pipe plugs makes it impossible for the well to unload through the drill pipe when pulling a stand. Or when the stand is pulled, the usual oiling of the derrick from top to bottom is eliminated. The use of the plugs on the top of the stand and the mud box on the floor deposits all the oil directly into the reserve or burn pits. The escapage of gas on the floor is avoided, thereby doing away with a fire hazard as well as the possibility of persons being overcome by gas.

The floor is always clean and clear of oil, removing the danger of men slipping and being injured by the fall.

The cost is very small but the safety features are great for men and machinery.

More on Drilling Safety

Before starting out of hole all snub lines and jerk lines should be checked to be sure they are in good shape—if not, they should be replaced. Make sure all clamps are tight on long lines. Two pairs of tongs should be used while coming out of hole. Never break pipe with rotary table.

Before going in hole, all spinning chains should be checked for weak links or bad tails. All floor hands should watch derrick man while going in hole to make sure that he does not snag the rope. Motorman should stand clear of last pipe row while pipe is being made up for fear of pipe being hit by backup snub lines.

From A. A. O. D. C. Safety Hints on Drilling. Courtesy Phillips Petroleum Co.

EQUIPMENT MEN
. . . in the News

General Geophysical Co. Elects New Officers

The board of directors of General Geophysical Co. has announced the election of new officers. Chester P. Sappington, formerly a vice president of General and a member of the firm since 1940 was elected chairman of the board. T. O. Hall has been named president succeeding Earle W. Johnson, founder of the company, recently deceased. Hall was formerly a vice president of the company and has been with General since 1938.

SAPPINGTON

T. O. HALL

Kenneth R. Wells, a member of the firm since 1936, was elected vice president, and A. B. Grubb was reelected secretary-treasurer, a position he has held since 1946.

Jones & Laughlin Named Ideco Distributor

George W. (Jack) Walton, vice president International Derrick & Equipment Co., has announced the appointment of Jones & Laughlin Steel Corp., supply division, as distributors of Ideco products in Canada and continental United States, excepting California, Washington, and Oregon.

Walton further stated that the addition of the 114 Jones & Laughlin store points and sales offices will greatly increase the availability of Ideco equipment in key oil centers as well as extend new coverage to other areas.

Powell Valves Appoints Pierce and Williams

James Coombe, president of the William Powell Co., has announced

KEMP PIERCE

TOM WILLIAMS

the appointment of Kemp Pierce and Tom Williams as sales representatives of Powell valves as part of a company-wide sales expansion program.

Pierce, formerly of Gray Tool Co., is a graduate of University of Houston, receiving a B.S. degree in engineering.

Both Williams and Pierce will be connected with the Houston office of the Powell company.

Rector Well Names Tipsword Head Kansas-Oklahoma Area

W. R. TIPSWORD

According to an announcement by J. L. Pinkard, sales manager of Rector Well Equipment Co., Inc., Fort Worth, Wallace R. Tipsword has been placed in charge of the company's Kansas - Oklahoma district, with headquarters in Tulsa. Tipsword has been a sales representative for Rector since February 1952, having been located at Oklahoma City until his recent promotion and transfer to Tulsa. Prior to joining the company, he was West Texas sales representative for a pump company for 2½ years. Tipsword attended University of Tulsa where he received his B.A. degree.

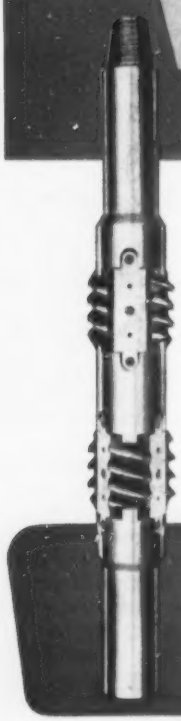
GM Opens New Petroleum Industry Sales Office

Allison Division of General Motors Corp. has announced the establishment of a petroleum-industry sales office at Tulsa.

Manager of the new office will be John P. Lord, petroleum sales engineer. F. C. (Red) Randall has been named service representative.

Lord, a graduate of University of Michigan, came to Allison in 1941 as

HOW IS THE "WORKING SURFACE"
—the Vital I. D. of your Casing?



YOU CAN SAFELY, easily and economically remove burrs from gunshot holes, imbedded bullets, or sheaths of cement or hardened mud from the inner wall of casing. ★ No more cut and torn rubber swab cups, or rubber packing elements on testers, packers and cement retainers. ★ The strong, safe Baker ROTO-VERT Casing Scraper has two sets of deeply hard-faced blades which shear away all obstructions and overlap to scrape the full 360-degree inner surface of casing. ★ Cannot "screw down" past gunshot burrs because the cutting edges follow the contour of a LEFT-HAND screw. ★ Specify the ROTO-VERT when there are hundreds of burrs to be removed, or the well is to be scraped from top to bottom. ★ You can still use time-tested Baker Model "B" Casing Scraper, Product No. 620-B, for normal scraping when rotary equipment is available.

ROTATE IT OR SPUD IT!
Your casing really "comes clean" when you use the successful BAKER ROTO-VERT Model "C" Casing Scraper

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30 ALGONQUIN ROAD DES PLAINES, ILL., U.S.A.

a student engineer. In 1942 he became a senior project engineer, and in 1951 was appointed sales engineer in transmissions. In 1952 he became supervisor, commercial sales in transmissions.

Leschen Establishes New Southwest Sales District

F. E. SUDER

A new sales district covering Texas, Louisiana, and Oklahoma has been established by Leschen Wire Rope division, H. K. Porter Co., Inc., St. Louis, it has been announced by D. W. Vernon, vice president and general manager.

The new district has headquarters in Houston, and will be managed by F. E. Suder. Suder has been with the Porter organization in various capacities since 1951. He held sales and management positions with National Supply Co. and International Derrick & Equipment Co. before becoming associated with Porter.

Continental Opens Branch Store at Victoria, Tex.

Continental Supply Co. has opened a new branch store in Victoria, Tex. The building houses both the store and warehouse.

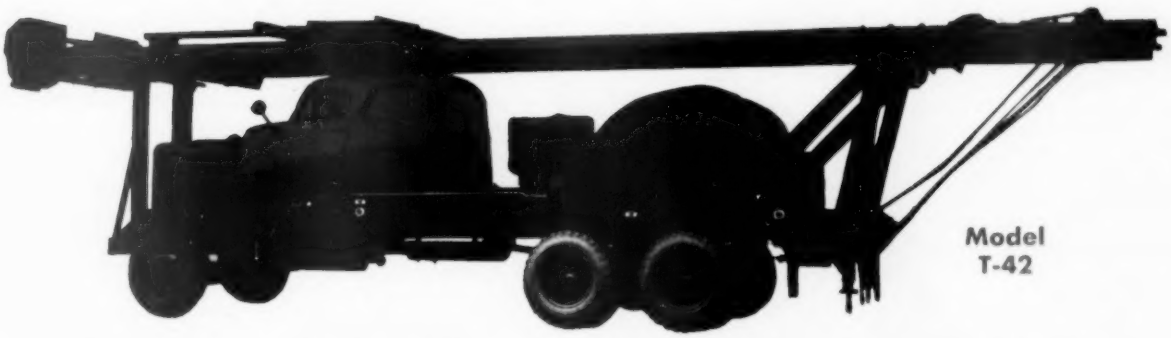
G. E. Ashmead, formerly of the Alice, Tex., store, is branch manager. He will operate under the supervision of N. D. Lane, district manager at Corpus Christi, Tex.

Lane-Wells Co. Awarded First Prize by A.I.M.E.

At a recent meeting of the Pacific Coast chapter of the American Institute of Mining and Meallurgical Engineers, Lowry Wadsworth, General Petroleum Corp., chairman of the A.I.M.E. Pacific Coast chapter, presented an award to Morton T. Higgs, Lane-Wells Co. vice president, in front of the Lane-Wells booth which was awarded first prize. Second-place award went to McCullough Tool Co., and third-place award to Core Laboratories.

The Latest

for 6,000′ to 10,000′ Servicing!



Model
T-42

COOPER Self-Propelled SERVICING WINCH

It's not a truck with a winch added on, but a single unit engineered from the ground up for the specific purpose of servicing oil wells.

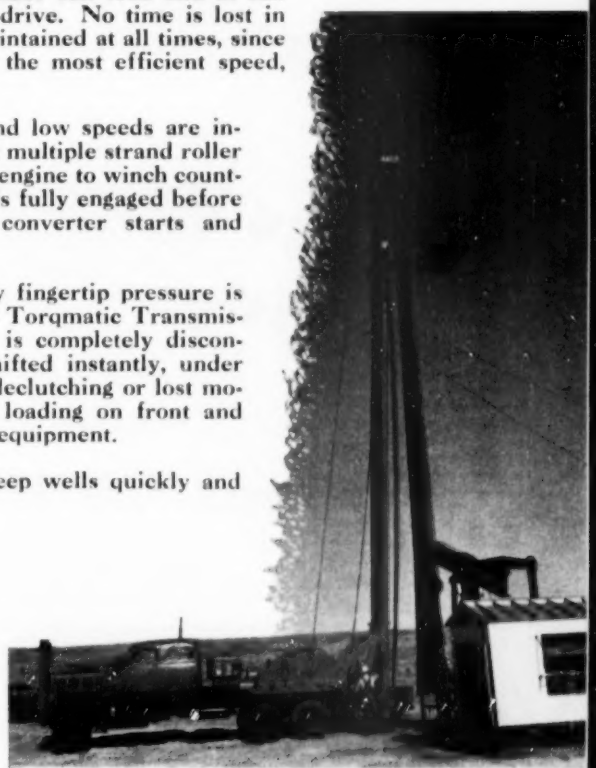
TORQUE CONVERTER—TORQMATIC TRANSMISSION FOR MAXIMUM EFFICIENCY, SPEED AND EASY OPERATION.—The three speed Torqmatic Transmission can be shifted under full load and at full speed without slowing down or declutching any drive. No time is lost in stopping to shift gears. Maximum efficiency is maintained at all times, since the engine and Torque converter can be run at the most efficient speed, regardless of load.

ONLY ONE AIR FRICTION CLUTCH is used in drum, high and low speeds are instantly available in Torqmatic Transmission. Only one short multiple strand roller chain is used in drum drive. Torque tube drive is used from engine to winch countershaft. Clutch slipping to start load is unnecessary. Clutch is fully engaged before applying power, eliminating wear and heat. The Torque converter starts and smoothly accelerates the load.

ON THE ROAD, power steering makes it easy to drive. Only fingertip pressure is required to turn wheels even when standing still. The same Torqmatic Transmission drives both winch and tandem axle. Drive not in use is completely disconnected. There are no idling drives. Transmission can be shifted instantly, under full power, into any gear as road conditions require. No declutching or lost momentum. Proper load distribution engineered for proper loading on front and rear axles and with sufficient bed space for tools and other equipment.

AMPLE POWER, brakes and line capacity to service your deep wells quickly and safely. Your choice of Diesel or Gas Engines.

EXTRA EQUIPMENT—Rotary drives, telescoping mast, tubing boards, rod hangers, catheads, drum dividers, line guide shells and air compressors for tongs. Single or double drum models.



The most complete line of well servicing equipment. There is a proper size and type to fit any depth wells or any field condition. You can service them faster, safer and at less cost with a COOPER.

FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Houston, Odessa, Los Angeles

dollars and cents logic...

about GOODALL Rotary Hose...

When you buy your first length of Goodall Long-Life Rotary Hose, you establish a maintenance program just as you do with other salvable equipment. You would not junk a two thousand dollar field car, for example, just because it had a flat tire and was out of use temporarily. You would not discard a drawworks just because the brake needed relining. Yet some operators buy a fifteen hundred dollar rotary hose and are forced to junk it the first time it suffers a break or rupture. With Goodall Long-Life Rotary Hose, your investment is protected by Goodall's exclusive maintenance. Goodall factory maintenance means extra long life and thousands of extra feet of drilling. No length of Long-Life Hose which has been repaired in our shop has ever failed in service. Why buy any other hose that does not give you this extra protection, extra long life — at no additional cost.

Goodall has been FIRST with every worthwhile rotary hose development!

GOODALL RUBBER COMPANY
TRENTON, N. J.

GOODALL RUBBER COMPANY OF TEXAS: Houston, Odessa, Texas.
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GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit.
EXPORT: Goodall Rubber Company, Trenton, N. J.
STOCKING DISTRIBUTORS: Texas and Louisiana—Houston Oil Field Material Co.; Wilson Supply Co.
Oklahoma—Iverson Supply Co.

DIGEST OF NEW EQUIPMENT

IT'S NEW — CHECK IT

TRADE LITERATURE

1 50 YEARS—A START FOR THE FUTURE. The 24-page book sketches the past with drastic brevity and then concentrates on the company's present and future. In text and 60 pictures, the golden-anniversary book shows an enterprising, fast-growing company in operation, reveals its policies, practices, and purposes in sections devoted to its employes, its products, and its progress. *Standard Pressed Steel Co.*

2 NEW EMERGENCY ELECTRIC POWER BULLETIN. A new four-page, two-color catalog-in-brief describes and pictures Homelite carryable generators designed to supply emergency electric power. The new literature explains the various functions and uses of these compact, lightweight, gasoline-engine-driven generators for industry. The booklet, L-411, also includes a section on specifications, electric output, and prices of five of its most popular models. *Homelite Corp.*

3 NEW PRESSURE EQUIPMENT CATALOG. Bulletin No. 400 covers separators, traps, and boiler trim gives adequate size and pressure tables and technical data on the most frequently used equipment. *Wright-Austin Co.*

4 NEW FLEXON EXPANSION JOINT DESIGN GUIDE. A new 24-page catalog is packed with engineering application and selection data necessary to the proper solution of pipeline expansion problems. Features of the design guide includes a discussion of the various types of expansion joints on the market, the many types of expansion joints available, and types of pipe-line motion solved by expansion joints. *Flexonics Corp.*

5 KEYS AND SWITCHES. New 12-page catalog describes how these keys and switches are being used to connect into low-voltage-circuit thermocouples, Thermohm or Rayotube detectors, conductivity cells, batteries, galvanometers, or other two or three-lead elements. Included in this catalog are photographs and line drawings illustrating the design features of the keys and switches. Necessary dimensions and mounting directions are given. All specifications are arranged in tables. *Leeds & Northrup Co.*

6 BAKER-LULL FOUR-WHEEL-DRIVE SHOVELOADER. Advantages of using a three-to-one planetary-type gear reduction in each wheel are explained in an eight-page, four-color brochure. This literature also gives complete specification data on this new 1½-cu. yd. unit such as loading capabilities and detailed tractor information. *The Baker-Lull Corp.*

7 A CENTRIFUGAL SEPARATION GUIDE explains the five basic separations accomplished by the Merco centrifugal separator. Detailed charts and descriptive data describe how the Merco controls concentration, washing, clarification, soluble recovery and classification in chemical and processing applications. Two-color cutaway drawings are used to illustrate the return-flow principle, which allows fully continuous separation, 24 hours a day, 7 days a week. A portion of the guide is devoted to a discussion of typical Merco process-flow plans, illustrating the separators arranged in two and three stages. *Merco Centrifugal Co.*

8 GIVE YOUR ROPES A CHANCE consists of a series of 14 illustrated instruction sheets covering proper care, use and maintenance of wire rope.

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Corresponding to new equipment items or trade literature abstracts in the Oil and Gas Equipment Digest of The Oil and Gas Journal, Nov. 9, 1953

PLEASE PRINT
COMPANY NAME .....
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CITY ..... ZONE NO. ..... STATE .....
NAME ..... TITLE .....

Subjects discussed include: winding wire rope on an ungrooved drum; reeling and unreeling of wire rope; pulleys and sheaves; grooving of drums; storage; lubrication; and correct splicing. *Martin, Black & Co.*

9 DIFFERENTIAL FILL-UP EQUIPMENT. Bulletin 302, a four-page multicolored brochure, contains operational data and a cutaway illustration of new equipment for running casing. The Differential Fill-Up Shoe is designed to perform two primary functions: to fill the casing automatically, as it is being run, to within 90 per cent of the fluid level of the annulus, and to permit the introduction of the action of a back-pressure valve for floating or cementing. *Baker Oil Tools, Inc.*

10 OIL VALVES CATALOG 480. This stiff-bound general catalog covers physical and chemical characteristics of materials used in the manufacture of flanges, globe and angle valves, gate valves, check valves, plug valves, safety valves, and valves for chemical fluids. Each item is illustrated and is accompanied by full engineering data. *Dikkers.*

11 HOUGH MODEL HR 4 WHEEL DRIVE "PAYLOADER" TRACTOR-SHOVEL is the subject of a new 16-page catalog. Profusely illustrated, it contains action views of this unusual 1-cu. yd. machine doing earth and material-handling jobs. Exclusive and important details are fully highlighted. Included also are pictures and detailed specifications of all seven sizes of Payloaders. *The Frank G. Hough Co.*

12 THE INSIDE STORY ON THE PACKAGE COMPONENT DESIGN OF THE THEW LORAIN TL SERIES. It is a transvision presentation that enables one to see inside the machine. One of the features of the Lorain TL Series of power shovels and cranes is the packaged assembly of the turntable. All major assemblies such as hoist shaft, clutch shaft, and engine are completely packaged components, built as integral subassemblies for ease of assembly, disassembly, and servicing. *The Thew Shovel Co.*

13 NEW LP-GAS VALVE BROCHURE is a colorful informative brochure, illustrating and describing the complete selection of new L.P. gas valves. Construction details, basic specifications, and valve applications are furnished for bronze globe, angle, check, spring-loaded check, and gate valves which carry the required 400-psi. w.o.g. pressure rating. The valves are recommended for all common commercial forms of liquefied petroleum gases whether handled in liquid or gaseous state and are designed for application on all types of piping systems for storing, transporting, and utilizing these gases. *The Fairbanks Co.*

14 POP SAFETY AND RELIEF VALVES is an informative, comprehensively illustrated, 12-page circular. Complete with leading dimensions this circular comprises much valuable information in the form of steam, air, and gas-relieving capacity tables. Also featured is a table of multipliers for computing relieving capacities at various inlet temperatures. Another table of multipliers permits computing relieving capacities for air valves for use in handling gases and vapors. *The Lunkenheimer Co.*

15 NICHOLSON INDUSTRIAL STEAM TRAPS. The new 12-page bulletin No. 853 features steam traps equipped with bellows of bronze, monel, or stainless, and bodies in bronze, semisteel, and cast-steel construction in sizes ¼ to 2-in., for all pressures from vacuum to 300 psi. Included beside capacity tables and dimensions are recommended piping diagrams, typical applications, and tables and data covering the selection of traps for various types of steam-using equipment. *W. H. Nicholson & Co.*

16 FOAMGLAS. A new four-page folder features on-the-job installation photographs pointing out the advantages of cellular glass insulation for pipe temperatures between —300° and +800° F. A complete listing of the physical properties of Foamglas and condensed recommended specifications make the folder an excellent reference for engineers, applicators, and insulation contractors. *Pittsburgh Corning Corp.*

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Corresponding to new equipment items or trade literature abstracts in the Oil and Gas Equipment Digest of The Oil and Gas Journal, Nov. 9, 1953

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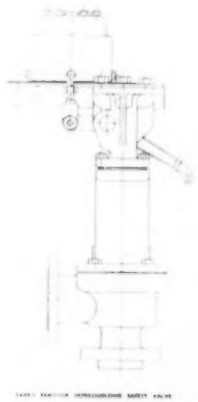
DIGEST OF NEW EQUIPMENT

IT'S NEW CHECK IT

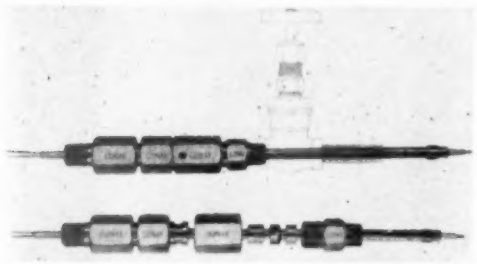
by Dan B. Miller



17 REMOTOR is designed to rapidly depressurize pressure vessels in event of an emergency and also to function as an unloader for those applications where the unloading feature can be combined with a safety valve. In addition the depressurizing component is interchangeable and can be readily mounted on other Farris safety valves, already installed. It will operate efficiently under all conditions, including fire, freezing, and current failure and offers the user the economies of eliminating costly "special" valves and controls. Remotor valves supply the following features: operation by air pressure from remote points; rapidly depressurizing vessels in service to predetermined limit or to 0 psi.; safety-relief and drop-out service in one installment; and extra power air motor, affording one regulated power supply for a series of valve installations. Remotor valves are available with standard depressurizing motors in valve sizes from 1 by 1½ in. to 2½ by 4 in. and extra-power depressuring motors in valve sizes 3 by 4 in. to 8 by 10 in. *Farris Engineering Corp.*

IT'S NEW CHECK IT

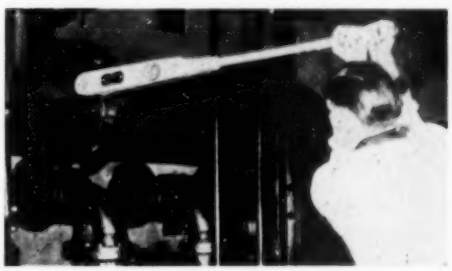
18 NEW CONAX C-U-P GLAND permits changing exposed wire thermocouples without reducing pressure on the system. This allows continuation of operation while



removing and replacing burned-out thermocouples. The protection tube enters the pressure system through the packing gland and gate valve. The thermocouple gland provides the pressure seal around the exposed wires inside the tube. The packing gland seals the outside of the tube in normal operation and while the thermocouple and tube are being slid in or out of the system. When the thermocouple is pulled back past the gate of the valve, the valve can be closed to hold the pressure in the system. Complete removal of the thermocouple is then accomplished by loosening the packing-gland cap and pulling out the gland follower, sealant, and removable gland seat. A stainless-steel collar on the tube eliminates the possibility of removing the tube from the packing gland before closing the gate valve. C-U-P glands are capable of sealing several thousand pounds per square inch but, in operation, it is normally limited to about 500 psi. by the force required to slide the protection tube into a pressurized system. Temperature range is determined by the sealant selected. Asbestos-graphite, standard for the packing gland, will withstand 700° F.; Teflon, 500° F.; and Neoprene, 200° F. *Conax Corp.*

IT'S NEW CHECK IT

19 1,000 LB. TORQUE WRENCH accurately tightens nuts to any predetermined stress during the construction or servicing of equipment in plant or in the field. The



torque wrench has a capacity from 0 to 1,000 ft.-lb. This wrench definitely shows when nuts and bolts are tight enough and not too tight. The stay-set dial accurately registers torque reading and remains at maximum after tension is released. Thus a carefull check of obtained tension is possible after pulling has ceased. The dial is reset simply by turning the center knob. Each bolt will carry its proportionate share of the designated load, assuring uniform tension to prevent equipment failures due to improper or

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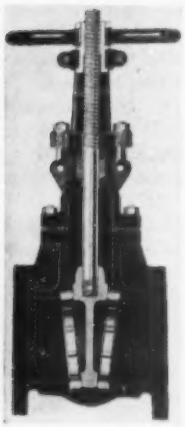
This Digest of New Equipment offers you a quick resume of important features of new or improved products and trade literature and the opportunity to obtain complete information on each subject by use of the convenient "CHECK IT - MAIL IT" service card.

uneven torquing of nuts and bolts. Where heat and pressure are involved, this correct torquing is doubly important due to the increased stress on each part caused by expansion. *Frontier Industries, Inc.*

IT'S NEW CHECK IT



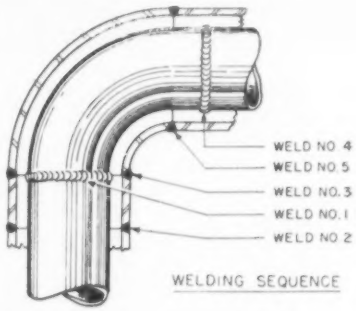
20 3 PER CENT NICKEL IRON GATE VALVE. A new 125-lb. iron gate valve, designed for mildly corrosive service in the process industries, has a cast-iron body and bonnet of 3 per cent nickel, giving an extra margin of corrosion resistance over ordinary cast iron in many services. The trim, where corrosion usually does the greatest damage, is made of the most corrosion-resistant alloys used for valves. A choice of trim materials is offered; either 18-8 Mo stainless steel or all-monel. It is designed to give economical service on mildly corrosive installations in the oil and many chemical processing industries. The disk guides in iron valve bodies are precision machined. These machined guides hold the disk in perfect alignment as the valve is closed, preventing pressure from forcing the disk against the opposite seat. As a result, the disk cannot chatter and cause excessive wear as the valve is operated. *The Lunkenheimer Co.*

IT'S NEW CHECK IT

21 LIGHTWEIGHT PIPE-CUTTING AND BEVELING MACHINES. Use of a special metal has made possible a weight reduction of 40 per cent on the larger machines. The new lightweight, tough metal shows minimum wear, scratch, break, or other deterioration under punishing conditions. A destructive laboratory test showed practically no change in close tolerances of the gear after 25,000 revolutions with sand and other abrasives being blown into the gear. After a month's continuous field use, a micrometer check still showed no wear on the machine. Weight reductions accomplished by use of the new metal are: the No. 3 machine for 14 to 20-in. pipe, formerly 89½ lb., now 53 lb.; the No. 4 machine for 22 to 26-in. pipe, formerly 123 lb., now 66 lb.; and the No. 5 machine for 28 to 36-in. pipe, formerly 155 lb., now 95 lb. *H & M Pipe Beveling Machine Co.*

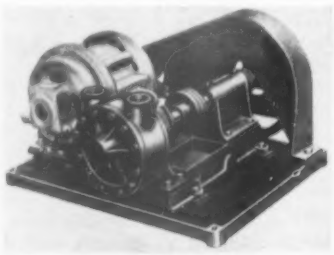
IT'S NEW CHECK IT

22 NEW WAY TO JACKET FITTINGS. A simple and relatively easy way has been found to employ welding fittings for directional changes in jacketed piping systems. The jacketed fitting combination consists of long and short radius 90° Tube-Turn elbows, with their center-line radii closely matching. On one end of the inside elbow is a tangent that extends beyond the corresponding end of the outside elbow. On the other end of the inside elbow a short piece of pipe is attached to facilitate the installation work. The welding sequence, shown in the accompanying drawing, must be followed exactly. This type of jacketed fitting offers important technical advantages and lowers fabrication costs. Specifically, it eliminates the need for steam or coolant jumpers; and eliminates flanged joints, except where piping must be disassembled. *Tube Turns, Inc.*



IT'S NEW CHECK IT

23 NEW PUMP FOR HEAVY FUEL OIL is a V-belt-drive pump designed to deliver heavy fuel oils at operating pressures up to 100 psi. This unit has been added primarily to operate in conjunction with the new "CF" closed-flame gas-oil burners. The pump is a smooth-operating unit with high-suction-high-discharge characteristics for delivering a continuous, pulsation-free stream of fuel oil to the burner. It has a gear-and-crescent-type pumping element, which pumps equally well in either direction at 400 r.p.m. The unit can be used for severe continuous duty pumping of heavy fuel oil without cavitation, pounding, or churning. The V-belt drive is connected to the pump by a loose coupling, preventing side pull on the pump shaft. This assures longer pump life under continuous service. Belt tension is simply controlled by adjusting center distance of the motor. *Eclipse Fuel Engineering Co.*



IT'S NEW CHECK IT

24 JETWELD ELECTRODE incorporates powdered metal into the electrode coating. Jetweld is a heavily coated shielded-arc type of electrode for operation in flat or near flat positions with a.c. or d.c. welding current. It is especially well suited for horizontal and flat position fillets, horizontal and flat position laps, single and multiple-pass butts, deep grooves and corners, and for cover pass on multiple-pass butts. It is ideally suited for welding, without cracking and without surface holes, some higher-carbon steels. Weld metal is uniform X-ray quality, free from undercut, with better impact values at low temperatures. Typical physical properties, as welded, are: tensile

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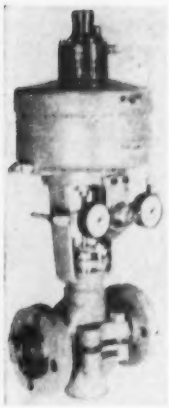
strength, 93,000 psi.; yield point, 79,000 psi.; elongation in 2 in., 15 to 22 per cent. Typical Charpy keyhole impact value at room temperature is 28 ft.-lb. At —70° F. value is 20 ft.-lb. Welding speeds typical in lap and fillet work are on the order of 12 to 15 in. per minute. Bead appearance is smooth, comparable to that normally associated with automatic hidden arc welding. The slag produced curls off as it cools to make the welds practically self-cleaning. *The Lincoln Electric Co.*

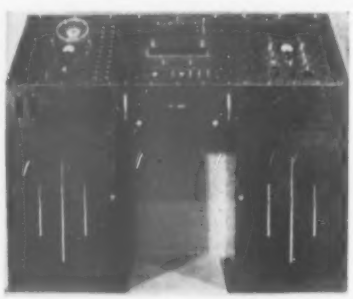
IT'S NEW CHECK IT



25 NEW CONTROL-VALVE LINE. The topwork of the LB series consists essentially of an aluminum cylinder with carefully bored and honed internals, a plastic piston with graphite impregnated O-ring seal, and an integral positioning device that permits the static or cushion loading pressure to be in either the upper or lower cylinder chamber. Coupled with the reversible Conoplug, it permits any possible combination of forces to cope with unbalanced loads, and/or requirements for predetermined plug positions on loss of operating air pressures. The operator is capable of positioning accurately to well over 1 part in 1,000 of instrument output span. This new valve series is presently available in sizes up to and including 4-in. and for Series 15, Series 30, and Series 60 body ratings. The LB series valve bodies are available as standard in carbon steel, bronze, aluminum, 316 stainless steel, Hastelloy, and Duriment plus a number of semistandard alloys. Trim materials include alloys, hardened stainless steel, hard-faced metals, and nonmetallic seating surfaces. Angle-type bodies are available as well as straight-through designs. *Conoflow Corp.*

IT'S NEW CHECK IT

26 MODEL 21 COMBINATION REFLECTION-REFRACTION SEISMOGRAPH. All components of seismic equipment, except geophones, batteries, and cables, are self-contained in the console aluminum cabinet, thus permitting rapid transferral from one truck to another. The complete set can be installed or removed in less than an hour. The amplifier is designed and constructed as two separate and distinct amplifiers on a common chassis. One of the amplifiers is a refraction amplifier, the other is a reflection amplifier. They may be used separately, or together, by a simple switch. In operation together the amplifier is refraction until after all first breaks are in, and is then switched automatically to reflection. Filter combinations are free of ring or oscillation but have the variable band width over the whole seismic spectrum. The combination of reflection and refraction gives excellent first breaks, even with small charges, long spreads, and considerable wind disturbance. Easy access to all circuits and tubes, and ease of checking geophones and other components facilitate regular maintenance. *Engineering Products, Inc.*

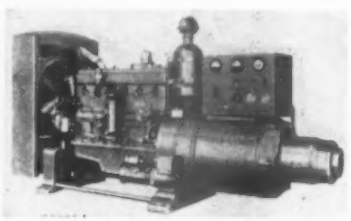


IT'S NEW CHECK IT

27 GENCO TYPE-A, DEEP WELL SURVEY INSTRUMENT is a full mechanical, precise, easy-to-operate instrument for determining number of degrees and direction that drill hole has drifted from vertical. It is a punch-type well-survey instrument which records the drift and the direction of the well bore without any effect from temperature rise. It can be run separately in case the hole deviation of direction is desired. It is free from troubles, needs no flush valve, film, or battery. It is equipped with a contact timing watch. Within 2 minutes after the instrument reaches the bottom of the well, the plumb bob punch records drift and direction on the paper disk by means of the watch. *General Precision Tool Co.* (This item erroneously listed as Daiichi Trading Co. in August 24 issue)

IT'S NEW CHECK IT

28 NEW 50,000-WATT ELECTRIC PLANT. A new 50-kw., 62.5-kva. electric plant, Model 50KA, is designed for any type of job requiring heavy-duty primary or emergency standby power. It will deliver a full rated 50,000 watts at 80 per cent power factor with ample overload capacity. The engine delivers 104 hp. at 1,800 r.p.m. and has a 450-cu.-in. piston displacement. The Onan-built generator is of dripproof design, direct connected to the engine for permanent self-alignment. It has excellent motor-starting characteristics, with ample overload capacity. Voltage regulation is plus or minus 2 per cent. An improved brush rig design features constant-pressure brush springs. The control box, mounted over the generator, is equipped with a charge-rate ammeter, electric water-temperature gage, electric oil-pressure gage, start-stop buttons, and running-time meter. An automatic voltage regulator is installed inside the control box. *D. W. Onan & Sons, Inc.*



IT'S NEW CHECK IT

REFINING

Bay Installing New Cat Cracker at Bay City, Mich.

LOS ANGELES.—Southwestern Engineering Co. here will design and erect a "packaged" Thermofor catalytic cracking unit at Bay Refining Corp.'s Bay City, Mich., refinery.

The installation will have a 6,000-bbl. catalytic cracking unit and a 300-bbl. catalytic polymerization unit, with necessary auxiliary equipment. The $3,000,000 project, which is expected to be completed next fall, will increase the refinery's crude run to 10,000 bbl. daily.

The Bay contract constitutes the third such unit to be contracted by Southwestern.

Esso Lets Contract for Tank Units at New Shipping Center

NORFOLK, Va.—Esso Standard Oil Co. has awarded a contract to Chicago Bridge & Iron Co. for the erection of 10 tank units which will comprise the new 386,000-bbl. ship bunkering station the company will establish here.

Construction will begin in January and first shipments are expected by mid-summer. A 1,000-ft. pier will also be built to accommodate ocean-going tankers. The station will receive bunker fuel by tanker for pipe-line distribution to coal piers in the port area, so that ships can be bunkered while loading.

Esso also plans in the future to erect a complete fuel refinery in the area. The refinery, for which plans are not yet completed, will probably have a capacity of 40,000 to 50,000 bbl. per day. It will incorporate catalytic cracking and other modern processing facilities.

Pan Am Dedicates New Unit

TEXAS CITY, Tex.—Pan American Refining Corp.'s new fluid catalytic cracking unit was officially dedicated here last week.

The new unit is of the latest design and will incorporate the newest processes for producing greater amounts and improved quality of gasoline for the company.

The cracking unit has been designed so that it has its own polymerization unit attached. It will process 30,000 bbl. per day of gas oil to produce more than 9,000 bbl. of high-octane blending stock. It is the second catalytic cracking unit at Pan American's Texas City refinery.

Refining Briefs

NEW YORK. — Cities Service Oil Co. has agreed to sell 74,000,000 gal. of aviation gasoline a year to Eastern Air Lines, Inc. The gas will be delivered to Eastern at Boston, New York, Newark, Lake Charles, La., and Miami, Jacksonville, Vero Beach, Daytona Beach, and West Palm Beach, Fla.

LOS ANGELES.—Union Oil Co. of California is tentatively planning to construct its proposed coking plant near San Luis Obispo and Santa Barbara, Calif. Union holds an option on a 3,200-acre tract in that area. The project is part of a $40,000,000 expansion program being carried out by the company *(The Oil and Gas Journal, October 5, page 322)*.

WAYNE, Pa. — Houdry Process Corp. has been authorized by Oxy-Catalyst, Inc., here to install catalytic oxidation units in refineries. The units, developed by Eugene J. Houdry, have found various commercial applications in minimizing air pollution by catalytically oxidizing waste industrial gases and fumes. They have been employed by Sun Oil Co. to recover waste heat by completing the oxidation of flue gases from the regeneration cycle of Sun's Houdry catalytic cracking units at Marcus Hook, Pa.

BOSTON.—The Committee on Vacuum Techniques, Inc., has been organized here to disseminate knowledge on high-vacuum technology and encourage research on new processes and equipment. Membership in the nonprofit corporation is composed of industrialists employing vacuum processes, universities engaged in high-vacuum research, and manufacturers of vacuum equipment.

CHICAGO. — Refinery maintenance will receive attention at two round-table conference sessions here during the Plant Maintenance and Engineering Conference, January 25-28. The conference will be held while the Plant Maintenance and Engineering Show is in progress here.

Night and day the clock around, week after week, month after month, NATIONAL AIROIL Tandem Combustion Units ceaselessly assure *"continuous operation"* for petroleum heaters in refineries throughout the Nation and the world.
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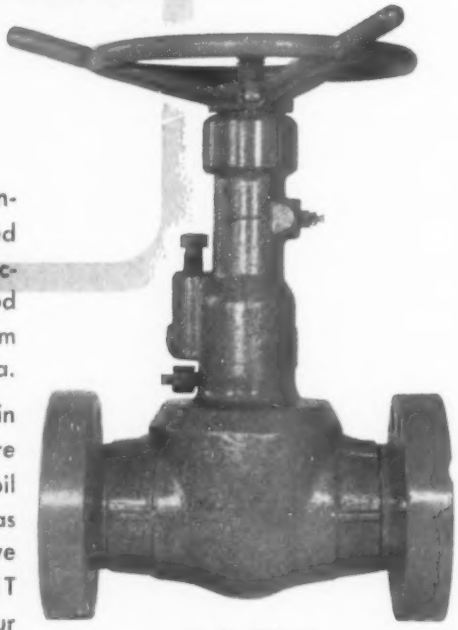

Fig. No. F206-15
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ORBIT VALVE COMPANY

BOX 699 **TULSA, OKLAHOMA**

DICKINSON, N. D.—A 30-ton fractionating column has arrived at the proposed site for Queen City Oil & Refining Co.'s new refinery here. Other units are expected shortly with construction to start immediately. Completion is set for next spring.

Petrochemicals

Petrocarbon Building Dallas Area's First Petrochem Plant

DALLAS. — The newly organized Petrocarbon Chemicals, Inc., plans to begin construction immediately on the first petrochemical plant in this area at Irving, Tex.

Upon completion in September by Tears Engineers, Inc., the $1,000,000 plant will produce naphtha fractions, such as toluene, benzene, and xylenes. This production will be marketed in the Southwest and Midwest primarily to the paint, varnish, and lacquer trades. Later other chemicals will be produced at the new installation, which will consist of a one-story laboratory and office building.

Petrocarbon is a new subsidiary of Stendel Oil Corp., Santa Barbara, Calif.

Oil to Aid Organic Chemistry In Big Future Developments

NEW YORK. — Startling developments in chemistry during the next few years will be made in the organic field through petroleum derivatives and natural gas, Hugo Riemer, president of Allied Chemical & Dye Corp.'s Nitrogen Division, predicted recently.

The prediction was made at the opening of the Nitrogen Division's new organic development center at Hopewell, Va., recently. "Organic chemistry is the most rapidly growing phase of our industry and has been responsible for a large part of the industry's recent expansion," he added.

The new center will be used to conduct intensive experimental work in the petrochemical field. In addition, the Nitrogen Division is constructing a plant at Orange, Tex., which will produce ethylene derivatives such as oxide and glycol.

In publishing the paper, "1952 Petrochemicals Valued at $2.75 Billion," by R. L. Bateman and J. A. Field, October 26 issue, page 102, proper credit was inadvertently omitted. The article was reprinted from Chemical and Engineering News, October 5, pages 4,074-4,079.

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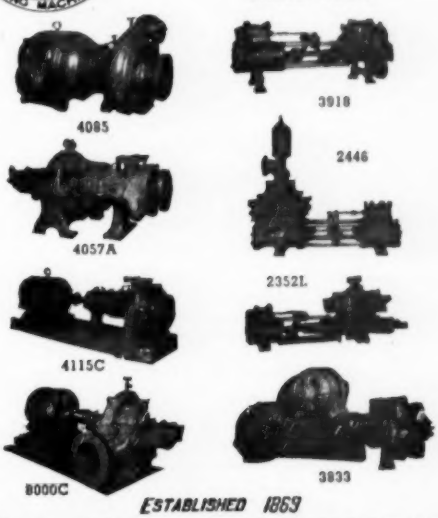

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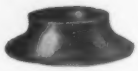
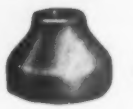


Nominal pipe sizes 1" to 24"



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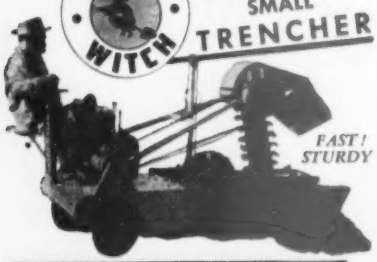

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PIPE LINE

Projects Approved

Columbia affiliates plan new gas-line facilities

WASHINGTON. — Seven Columbia Gas System subsdiaries have received Federal Power Commission authorization to construct $6,500,000 of pipe-line facilities to meet natural-gas demands during the winter months.

Certificates were issued to Central Kentucky Natural Gas Co., jointly to Manufacturers Light & Heat Co., Natural Gas Co. of West Virginia, Cumberland & Allegheny Gas Co., and Home Gas Co.; and jointly to Atlantic Seabord Corp. and Virginia Gas Transmission Corp.

The proposed projects are as follows:

. . . **Central Kentucky** will construct 8.8 miles of line paralleling an existing system running northward through North Means, Ky. The proposed line was rejected by the FPC last May, but a rehearing was granted. Under the recent ruling, the commission believes the $706,300 project is needed to enable the company to meet gas requirements in Cincinnati.

. . . **Manufacturers** plans to lay 38½ miles of new line and retire 11½ miles of line and 440-hp. in compressor capacity. This will take place in Lawrence, Washington, Adams, Allegheny, and Fayette counties, Pennsylvania; Hancock County, West Virginia; and Jefferson County, Ohio. Estimated cost will be $2,697,220.

. . . **Natural** will replace a 7½-mile line with a new one in Columbiana County, Ohio. This will cost $77,068.

. . . **Cumberland** will retire a 75-hp. compresser unit in Preston County, West Virginia, and Home Gas will remove 180-hp. in compressor units at a Broome County, New York, station.

. . . **Atlantic Seaboard** and Virginia Gas plan to build a 5,500-hp. compressor station in Upshur County, West Virginia, and add 1,760-hp. to an existing station in Hardy County, West Virginia. This joint undertaking will cost an estimated $2,986,500.

Colorado Interstate Plans 50-Mile, 20-In. Gas Line

COLORADO SPRINGS.—Colorado Interstate Gas Co. plans to lay a 50-mile, 20-in. pipe line from Morton County, Kansas, gas fields to a connection with Natural Gas Pipe Line Co. of America at Hooker, Okla.

The line is designed to supply an additional 20,000,000 cu. ft. of gas per day to Natural Gas which serves the Chicago area. Presently, Colorado Interstate is seeking Federal Power Commission authority to carry out the $4,000,000 program, which will include a proposed dehydration plant in Morton County.

New Lines Started

South Carolina laying 160-mile gas system

COLUMBIA, S. C.—Construction of nearly 160 miles of natural-gas lines from Aiken, S. C., to Columbia and Charleston has been started by South Carolina Natural Gas Co., a subsidiary of South Carolina Electric & Gas Co.

The project, which will consist of 10, 12, and 16-in. pipe, is being handled by Williams Brothers Co., Tulsa. Upon completion in late December, a trunk line will extend eastward from Aiken about 30 miles to Salley, S. C., where it will branch into two lines. One line will run northward 32 miles to Columbia; the other will extend southeast nearly 90 miles to Charleston.

Approximately 30,000,000 cu. ft. of

Pipe Liners Battle Rock

Rocky terrain in Tennessee and Kentucky proves to be tough obstacle in clearing right-of-way for Gulf Interstate Gas Co.'s 30-in. natural-gas line. When completed, the 860-mile transmission system will stretch from the Louisiana Gulf Coast below Lake Charles to Ashland, Ky. (H. C. Price Co. photo).

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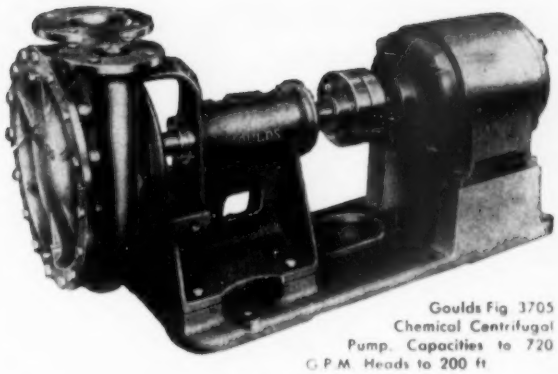

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gas daily will be supplied South Carolina Electric through a connection with Southern Natural Gas Co. at Aiken. Southern Natural is presently completing a 130-mile, 16-in. extension of its main system from Macon, Ga., to Aiken *(The Oil and Gas Journal, November 2, page 58)*.

Part of the gas will go to the cities of Summerville, Bamberg, Denmark, Orangeburg, and Walterboro, S. C., which are located on or near one of the branch lines. Presently South Carolina Electric's 26,000 customers in this southern portion of the state use manufactured gas. Towns in the northern part of the state get natural gas through the Piedmont Natural Gas Co.

Gabriel Opens First Crude Line Between U.S., Mexico

HOUSTON.—Gabriel Oil Co. has begun importing Mexican crude through a recently completed crude-oil pipe line—the first to span the Rio Grande River.

The 15-mile, 4-in. line extends from a connection with Petroleos Mexicanos near Reynosa in the Mexican state of Tamaulipas to a point south of McAllen, Tex. At McAllen the line ties in with existing facilities belonging to Continental Oil Co. The new line can transport up to 8,000 bbl. daily.

About 720 ft. of the line bridges the Rio Grande and is coated with concrete. Continental Pipe Line Co. built the system for Gabriel with Mitchell Darby Construction Co. of McAllen handling the pipe-laying project.

Permission to build another Mexican crude line is being sought by an undisclosed company. Reports indicate that the proposed line will run from production in Trevino field, Tamaulipas, to a point near Progresso, Tex. *(The Oil and Gas Journal, August 31, page 45)*.

Pasotex Gets Amortization For 150-Mile Crude Line

WASHINGTON.—Accelerated amortization for a 150-mile, 10-in. crude line from Snyder to Wink, Tex., has been granted Pasotex Pipe Line Co. by the Office of Defense Mobilization.

The company received a write-off of 75 per cent on $4,257,700. The new system will transport Scurry County sweet crude into Pasotex' existing 8-in. line at Wink for further transportation to the 28,000-bbl. Standard Oil Co. of Texas refinery at El Paso.

Also, The Texas Co. was given an

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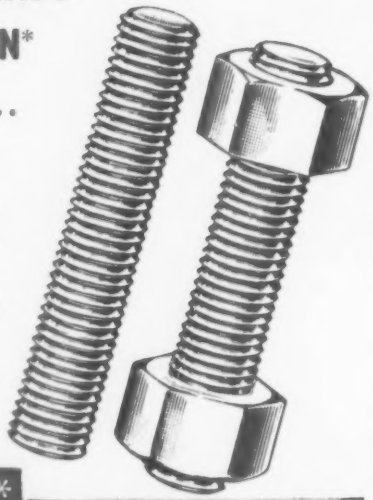

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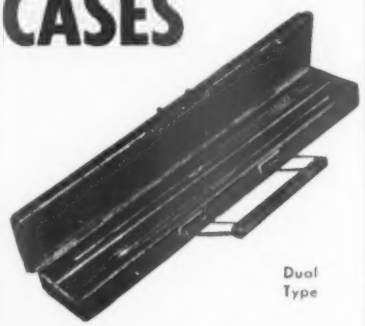

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accelerated amortization for a $239,600 project to convert a products pipe-line terminal at River Rouge, Mich., to a tank-loading terminal. Construction includes two new 11,300-bbl. tanks and necessary pipe-line and equipment facilities. A write-off of 40 per cent on $227,600 was granted for storage facilities.

$145.3 Million Products System Gets Write-Off

WASHINGTON.—A projected 300,000 bbl. daily products system from Beaumont, Tex., to Newark, N. J., planned by American Pipe Line Corp., New York, at a cost of $145,337,000, has been designated a defense facility by the Office of Defense Mobilization.

The ODM granted a quick write-off of 25 per cent of the $132,791,000 cost of the pipe line, 40 per cent of $6,900,000 for storage and 25 per cent of $4,406,000 for right-of-way. About $1,240,000 of the cost received no amortization.

FPC Rejects Chattahoochee's Proposed Georgia Gas Line

WASHINGTON.—The Federal Power Commission has rejected an application by Chattahoochee Natural Gas Co., Birmingham, to construct 70 miles of gas lines which would supply four Northwest Georgia communities with natural gas.

The rejection was based on a contention that the proposed consumer market would not grow large enough to make the $1,540,000 project economically feasible. The communities were Dalton, LaFayette, Summerville, and Trion.

Southern Natural Gas Co., Birmingham, planned to supply Chattahoochee with the necessary gas supply for this project through a proposed tap line. This proposal also was rejected by the FPC.

Price Releases 3-D Movie

BARTLESVILLE, Okla.—A 3-dimensional color movie on pipe-line construction entitled "This Is Your Line" has been released for public showing by H. C. Price Co. here.

The 12-minute film, claimed by Price to be the first of its type in the pipeline industry, covers the company's major construction work during 1953. This includes pipe-line projects for Tennessee Gas Transmission Co., Texas Gas Transmission Corp., Southern Natural Gas Co., and Gulf Interstate Gas Co.

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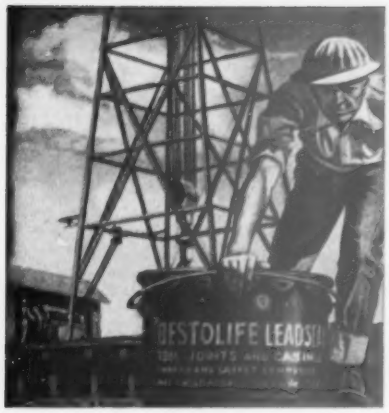

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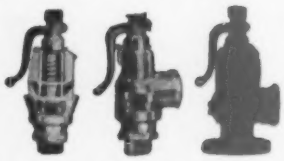

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Among the Drilling Contractors

Drilling Continues Active With 2,877 Rigs Running

Drilling continued at an active pace during the past week with 2,877 rotary rigs reported in operation. Although this total was 53 below the year's record number 2,930 rigs reported running the middle of October, it represented an increase of 24 rigs over the previous week, and 109 rigs over the number of active rigs during the corresponding week a year ago.

ACTIVE ROTARY RIGS*

Area—	Week ended 11-2-53	Change week ended 10-26-53	Change week ended 11-3-52
Gulf Coast	599	+19	+ 9
N. & W. Tex.-N. M.	820	+ 2	+ 26
Ark.-N. La.-E. Tex.	190	+ 6	+ 37
Oklahoma	347	+14	+ 17
Kansas-S. Nebraska	160	— 1	+ 1
Illinois-Eastern	147	— 9	+ 1
Rocky Mountains	297	— 2	+ 47
Pacific Coast	161	— 4	— 9
Total U. S.	2,721	+25	+129
Western Canada	156	— 1	— 20
Total	2,877	+24	+109

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States, and the Pacific Coast and Illinois-Eastern areas are shown on pages 213 and 214.

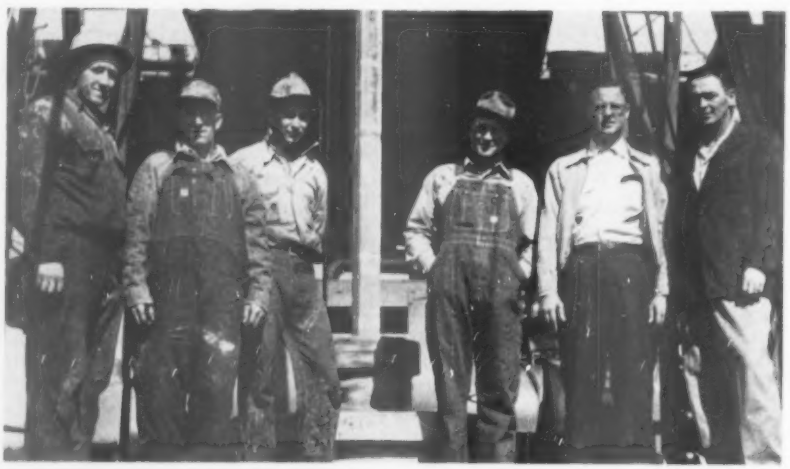
Substantial increases in drilling during the week were reported on the Gulf Coast and in Oklahoma with routine gains being made in West Texas and the Arkansas - North Louisiana - East Texas area. Decreases reported in other areas were nominal.

Santa Fe Drilling Co., Santa Fe Springs, Calif., has a rig under contract to Union Oil Co. of California for another test the latter company has projected for its large Tejon Flats block, in Kern County, California. Location of the test, 56-36 Evans, in 36-12-19, is approximately 6 miles north of Tejon field, nearest production. Contract is for 8,000 ft.

L & F Drilling Co. is contractor on a new wildcat test Richfield Oil Co. has under way on its Henderson lease in 34-6s-13e, 4 miles northwest of Merced, in Merced County, California.

Appell Drilling Co., contracting for its affiliate, Appell Oil & Gas Corp., is starting a wildcat test 15 miles northeast of Zapata, in Zapata County, Southwest Texas. Location is for 1 Vela, in Block 57, Foster Subdivision of Share 2, in El Grullo grant.

Dorris Ballew, Natchez, Miss., has a new wildcat operation under way for Austral Oil Exploration Co. in Jefferson County, Mississippi. Location is in the Buena Vista area, 2 miles west of



W. D. Donaldson (right end), vice president, Union Rotary Corp., Mount Pleasant, Mich., takes time for a picture on the rig floor of a 7,500-ft. test, 1 Lemcoal, his company is drilling for Carter Oil Co. at a wildcat location 15 miles from Traverse City, in Grand Traverse County, Michigan. At his right is Bob Wood, Mission Manufacturing Co. Crewmen in the picture, left to right, are: John Hutchins, floorman; Carl Wiggins, derrickman; John Vaughn, floorman; and Tony Ware, driller. (Picture by courtesy Mission Manufacturing Co., Houston).

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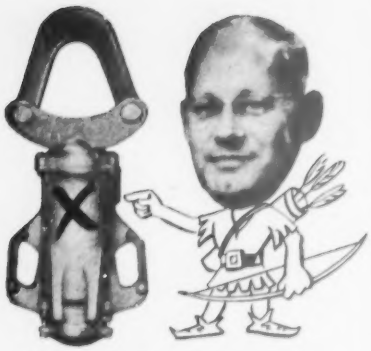

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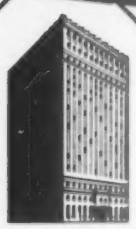

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Gilliam Lodge, on the operator's Phillips lease, in 9-10-2w. Hole is projected to 9,600 ft. for a Lower Cretaceous test.

Garland Anthony Drilling Co. has a rig working on contract to J. L. Perry, as trustee, of El Dorado, Ark., at a newly started rank wildcat operation 4½ miles southwest of Hamburg, in Ashley County, southeastern Arkansas. The test, listed as 1 Crossett, is projected to the Smackover horizon, expected at 4,900 to 5,000 ft. Spot location is in the C NE SE 9-18s-7w.

Barnwell Drilling Co., Shreveport, is drilling a Pettit lime exploratory test a mile southeast of Arkana, northern Bossier Parish, North Louisiana, on a contract with Robert S. Hays and associates, of San Antonio. Objective is expected around 6,200 ft. Location is at 1 O'Daniel, in 7-23n-12w, which is north of Carterville field, but more than 2 miles from nearest Pettit production.

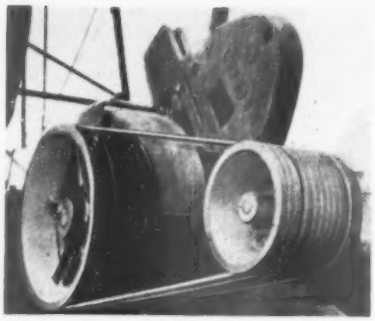
Green & Heiser Drilling Co. has a rig working for Standard Oil Co. of California in the rejuvenated Rosedale Ranch field, 8 miles northwest of Bakersfield, in Kern County, California. Current operation is at 21-12 KCL 31, in 12-29-26.

T & E Drilling Co., Bakersfield, Calif., is drilling on the first of two exploratory tests it has contracted to drill for Richfield Oil Corp. in the Tejon Hills area of southern Kern County, California. The initial test is 81-16 Tejon D, in 16-11-18, which is about ½ mile from production.

Prince Drilling Co., Houston, has contracted for an 8,750-ft. Wilcox wildcat test to be drilled for Holly Development Co. and H. J. Chavanne, trustee, 3½ miles southeast of Yorktown, in DeWitt County, South Texas. Location is for 1 Gohlke, in the W. W. Stubblefield Survey.

Stringer & Richard tools are being used on a 9,500-ft. test which C. G. Glasscock is starting at 1 Cunningham, 2½ miles southwest of Taft, in San Patricio County, South Texas. Location is in Section 57, George H. Paul Subdivision of Coleman Fulton Pasture.

W. L. Cotton, Inc., has been awarded contract by Blair-Vreeland and associates, of Corpus Christi, for a 3,000-ft. wildcat test, 1-B Lloyd & Lloyd, located in the BS&F Survey, 5 miles south of Freer, in Duval County, Southwest Texas.



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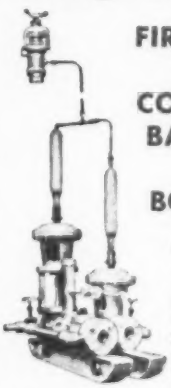

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NATURAL GAS

New Mexico Reveals Terms Of Gas-Proration Order

SANTA FE.—Details of New Mexico's first gas-proration order, which will go into effect January 1, have been supplied the state's 700 oil and gas operators by the state oil-conservation commission.

The commission has informed operators that the prorationing will be on a 160-acre basis. W. B. Macey, the commission's chief engineer, pointed out that "any deviation from the 160-acre rule would create undue hardship and could result in some operators being squeezed out."

The commission, which has been studying the situation for months, also felt that the present procedure for prorating oil from wells in gas pools should not be changed until further study is made.

$4 Billion Earmarked for Expansion in Next 4 Years

ST. LOUIS.—The gas industry will spend $4 billion on new facilities and expansion of present ones from 1953 through 1956, the American Gas Association reported at its annual convention here recently.

The report indicated that the companies plan to get 29 per cent of the funds for the proposed projects from internal sources, 51 per cent by long-term debt, and 20 per cent from sales of common and preferred stock. During the 1949-52 period expenditures reached $4.7 billion.

Hike in Deliveries Sought

WASHINGTON.—A Federal Power Commission hearing on Texas Eastern Transmission Corp.'s application to increase gas deliveries to several existing customers under its short-term firm service and winter-peaking service rate schedules opened here last week.

Recently the FPC granted the applicant a temporary permit to carry out the proposal. Those receiving additional gas under the short-term service rate schedule are Equitable Gas Co., National Gas & Oil Corp., Manufacturers Light & Heat Co., Ohio Fuel & Gas Co., Philadelphia Electric Co., and Public Service Electric & Gas Co. Those receiving the gas under the winter peaking service rate include City Gas Co. of New Jersey, National Gas & Oil, Philadelphia Electric, Philadelphia Gas Works Division of United Gas Improvement Co., and Public Service Electric & Gas.

Opposing the application are Manufacturers Light, Ohio Fuel, and National Coal Association.

Southern California Buys Playa del Rey Reservoir

LOS ANGELES.—Southern California Gas Co. has purchased the Playa del Rey, Calif., gas-storage reservoir from the U. S. Government for $2,150,000.

The property was offered for public sale last June and Southern California's bid was the only one received. Since that time the General Service Administration has had the bid under review. Under an agreement with the Government, the company has been operating the storage project for peak-day use since 1942.

Arkansas Louisiana Halts Gas Deliveries to St. Louis Firm

WASHINGTON.—Arkansas Louisiana Gas Co., Shreveport, is discontinuing to supply Mississippi River Fuel Corp., St. Louis, with approximately 12,500,000 cu. ft. of gas daily in accordance with a recent Federal Power Commission decision.

In concurring with Arkansas Louisiana's application, the commission ruled that the discontinuance of service would result in economic benefits to the applicant, and would not impair Mississippi's operations. Mississippi received the gas at Arkansas Louisiana's Munce compressor station in Ouachita Parish, Louisiana.

NATURAL GASOLINE

N.G.A.A. Announces Program For Regional Meet in Texas

AMARILLO, Tex.—Stanley Learned, vice president of Phillips Petroleum Co., Bartlesville, Okla., will be the guest speaker at the regional meeting of the Natural Gasoline Association of America here November 20.

Papers to be presented include: "Some Economic Changes Due to Increasing Value of Natural Gas," Milton Shaffer, Witco Chemical Co., Amarillo; "Reducing Mechanical and Human Errors in Gas Measurement," Cade Clover, Westcott & Greis, Inc., Tulsa; "Dehydrating Light Hydrocarbon Liquids," John Campbell, Black, Sival's & Bryson, Inc., Oklahoma City; "Our Resources and Petrochemicals," R. W. Rasmussen, Celanese Corp. of America, Pampa, Tex.; "Avoiding Responsibility Makes Trouble Inevitable," A. Ross Rommel, Humble Oil & Refining Co., Houston; "Man Against the Mountain," a movie on construction of Trans Mountain's new Canadian crude system with Guinn Williamson, Midwestern Constructors, Inc., Tulsa, discussing the engineering features of the line.

Two Companies Plan L.P.G. Storage Projects in Texas

AUSTIN.—Two Tulsa companies are seeking Texas Railroad Commission permission to carry out three L.P.G. underground-storage projects with a combined total of 400,000 bbl.

Neal Van Fossan, representing the two firms, told Examiner Charles Slack that Texas Gas Products Corp. plans two 100,000-bbl. projects in West Texas and its affiliate, Texas Natural Gasoline Corp., plans a 200,000-bbl. storage on the Texas Gulf Coast.

One of Texas Gas' storage proposals is for a 20-acre lease in the old Pembrook field, Upton County. The company proposes to wash out a cavity in a salt formation at approximately 2,082 ft.

The other 100,000-bbl. storage project is planned to underlie a 20-acre lease in the old Weiner Floyd area of Glasscock County. The salt formation is expected at depths between 1,280 and 1,305 ft.

Texas Natural's 200,000-bbl. project would be in Henry Griffith Survey in the Barbers Hill salt dome, Chambers County. Van Fossan testified that initially the cavity would reach about 1,350 ft., but later it would be deepened to 3,000 ft., providing for an additional 100,000 bbl. of storage capacity.

Runnels Opens New Plant

SAN ANGELO, Tex.—Runnels Gas Products Corp. has placed its new $3,000,000 cycling plant on stream in Cree-Sykes field, located in northeastern Runnels County, Texas.

The plant produces butane, propane, and natural gasoline from 20,000,000 cu. ft. of casinghead gas gathered in the field. The residue is returned to the producers for pressure maintenance, and any excess is picked up at the plant by Lone Star Gas Co. for distribution to consumers in this area.

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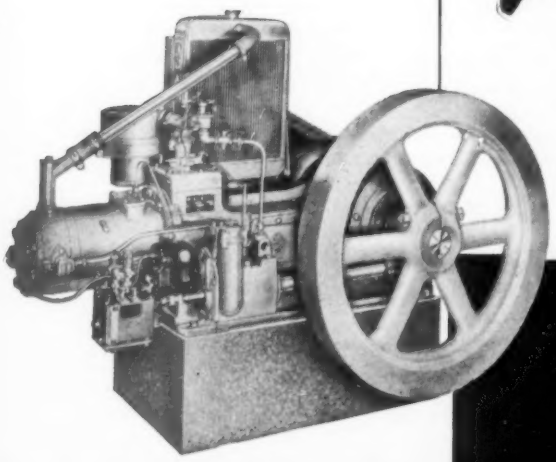

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EXPLORATION

Oklahoma's Stock Climbs Higher

by Philip C. Ingalls

RECENT discoveries in Oklahoma have broadened and brightened exploratory interest in this area which became a significant producer of oil while it was still Indian Territory.

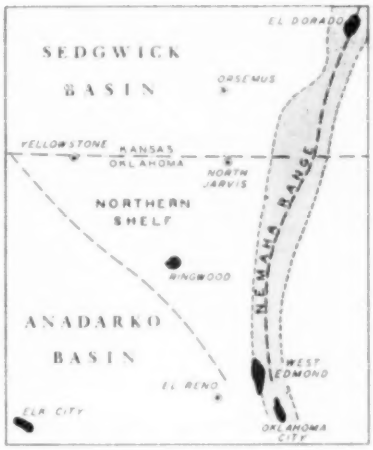
Of special interest at the present time is the northern shelf of the Anadarko basin. The potentialities of the Ordovician rocks of this shelf area have been recognized for quite a few years, but positive indications of their producing capabilities have been lacking until recently.

Yellowstone, Woods County's first producing field, was discovered by Champlin Refining Co. 1 Diamond, NE NE SW 17-29n-17w. This rank wildcat was completed flowing 25½ bbl. of 43°-gravity oil daily through a 1-in. choke from the Arbuckle at 6,134-40 and 5,149-52 ft. The well is considered to be the most important discovery in Oklahoma so far in 1953.

Obviously, the importance attributed to Champlin's discovery was not generated by its modest initial potential. And, though it is significant that the rank wildcat was completed in the Arbuckle, the extremely high interest in this well stems from the drill-stem-test performance of rocks now behind the pipe.

Three drill-stem tests in the Simpson below 5,830 ft., each taking in less than 25 ft. of section, flowed wet gas at rates in excess of 7 M.M.c.f. daily; and a test of the interval 5,862-75 ft. flowed oil at an estimated rate of 60 bbl. per hour. A drill-stem test at the top of the Arbuckle at 6,055-93 ft. flowed gas at a rate of nearly 10 M.M.c.f. daily. To add still more interest to the wildcat discovery was the recovery of a comparatively small flow of gas from the Viola. Two offsets to this well are now being drilled.

The regional importance of the indicated Simpson production in Champlin's wildcat is emphasized by Union Oil Co. of California's recent Simpson discovery (North Jarvis) in Grant County, and The Texas Co.'s recent Simpson discovery (Orsemus) in southeastern Kingman County, Kansas, both rank wildcats. A possible indicator of the southward extent of the new triangular-shaped Simpson-prospect province lying to the west of the prolific Nemaha range



The northern shelf of the Anadarko basin is one of the high interest areas of Oklahoma today.

and north of the Golden Trend, is the Simpson - Wilcox wet - gas production found at El Reno in Canadian County by Sinclair Oil & Gas Co. That 1952 discovery was confirmed by a southwest extension last July.

It is the suddenly materializing developments, such as the past few weeks have seen on the northern shelf, that have kept Oklahoma an active producing area for so many years. The shelf area is but an example. Other areas expected to play an important part in the future of Oklahoma are: (1) the wedge edges and pinchouts of Mississippian and Pennsylvanian rocks (especially the Springer sand) along the northeast flank of the Anadarko basin across the edge of the shelf area, and along the north side of the Wichita Mountains; (2) the Panhandle where oil and gas wells now are being completed on both sides of Hugoton gas field in several formations of Mississippian and Pennsylvanian age; (3) the "thoroughly" prospected areas where new developments in completion techniques are opening sands too tight to produce without deep fracturing and where reinterpretation of subsurface studies, both geological and geophysical, is turning up big oil-bearing traps formerly missed; (4) the deeper rocks of the big McAlester basin and possibly their extension under the Ouachita Mountains; and (5) the sparsely tested Hollis basin south of the Wichitas.

As with the country as a whole, the outlook for finding new oil in Oklahoma is more optimistic than it ever has been at any time in the past.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WYOMING . . . Northern Drilling Co. is running production tests at 1 Government, NW NW NW 12-41n-67w, in the southwest Black Thunder area of Weston County, after reporting a flow gage of 20 bbl. of oil per hour through open tubing from the Newcastle. This is the westernmost discovery in the broad southwestward extension of the Clareton trend. Weston County is most active area in the Rockies with 52 rotary rigs in operation.

TEXAS PANHANDLE . . . Humble Oil & Refining Co. is running casing at 1 S. P. and K. K. Jackson, Section 111, Block 45, H&TC Survey, 3½ miles north of Hansford and 10 miles southeast of Permian gas production in Hugoton field. The Anadarko basin strike flowed 6,125 M.c.f. of gas per day at 4,967-5,000 ft. The Texas Co. 1 Blakemere, Section 20, Block 4-T, T&NO Survey, 10 miles northeast of Hansford, flowed 6,580 M.c.f. of gas per day from Morrow sand perforations.

WEST TEXAS . . . Hunt Oil Co. 1 Amacker, deep test in west Upton County, developed a heavy flow of oil on drill-stem test in lower Wolfcamp limestone between 8,844-8,933 ft. Estimates on the flow ranged from 40-75 bbl. hourly. Cities Service Oil Co. 1-F Owens, west of Olson field in Crockett County, had gas-distillate production between 5,816-5,907 ft. The well flowed gas at the rate of 13,000,000 cu. ft. daily and produced 37 bbl. of distillate in 45 minutes, at which time the separator froze.

ROCKY MOUNTAIN

COLORADO

Roggen Area Discovery Flows

Spears and Colorado-Wyoming Oil Co. have tested 10 bbl. of oil per hour at 1 Zimbleman, C SE NE 22-2n-63w, "D" sand discovery in the Roggen area of Weld County. The operator tested the zone 7,038-63 ft. through 12/64-in. choke. Top of "D" sand was at 7,036 ft. The wildcat is a mile and a half southwest of a "J" sand discovery completed earlier this year by Twin Oil Corp., and is on land farmed out by Twin.

Arrow points to new Permian Black Hollow field in western Weld County just east of the Front Range fields in the Denver-Julesburg basin. The California Co. has completed 1 UPRR, NE SW SW 31-8n-66w, second Permian producer in the new field, for a pump gage of 320 bbl. of oil per day. Production is from the Lyons sand. A third well, 2 UPRR, NE NE SW 31-8n-66w, is now waiting on cement after landing surface pipe. Permian production was opened in the Denver-Julesburg basin last winter in Keota field.

MONTANA

Show Logged at East Poplar Area Wildcat

Richfield Oil Co. has released information on tests at 1 Ironbear, C SW NE 12-29n-50e, west of previous production in the East Poplar area of Roosevelt County. The well was drilled tight, and current reports of some oil shows are the first to be officially confirmed. After acidization of open hole 6,163-77 ft. swab recovery in 11 hours was 5 bbl. of oil and 135 of salt water. Through perforations at 6,011-15 ft. the recovery on 24 hours of swabbing was 157 bbl. of fluid, 1 per cent oil. The operator has set plug at 6,005 ft. and will perforate for further testing.

East Poplar Extension Finaled in Madison

Empire Oil Co. has completed 3 Cornejo, C NE SW 8-29n-51e for a gage of 3,984 bbl. of oil per day from two porosity zones in Madison lime. The well is an extension to this operator's 1953 discovery in the area which was completed for nearly 6,000 bbl. per day.

Production was at the rate of 1,632 bbl. daily from the B-1 zone, and at the rate of 2,352 bbl. per day from B-2. At a south offset to this well, Murphy Corp. has completed 30 Unit, C SE SE 8-29n-51e for 29-25 bbl. per hour from the B-1 zone, and 35-25 bbl. per hour from the lower B-2 zone.

Important Montana Wildcats Staked

Several important wildcats have been staked in Montana during the past week. In Richland County, Sun Oil Co. and others have made location for a deep test in the North Sidney area. The well will be 1 Beagle Land & Livestock Co., NE SW SW 17-23n-59e. It will go to Cambrian at about 13,200 ft. It is about 7 miles southeast of the Sun Oil Co.-Phillips Petroleum Co. discovery at 1 Dynneson, C SW NE 32-24n-58e, which was completed for 745 bbl. of Ordovician production daily.

Lion Oil Co. has spudded at 1 Knight, C SW NW 29-14n-60e, in the Wibaux area of Wibaux County, and was last reported drilling below 4,850 ft. The well is located between Cedar Creek anticline production in Montana and the Fryburg area of North Dakota.

C. H. Murphy, Jr., has made location for a wildcat in the East Porcupine area of Valley County. The well is 1 Firemoon, C SE SE 12-30n-41e. It will be a 7,685-ft. Cambrian test.

WYOMING

Weston Discovery Flows From Newcastle Sand

Northern Drilling Co. is continuing production tests at 1 Government, NW NW NW 12-41n-67w, southwest of the Black Thunder area in Weston County, after reporting a flow of 20 bbl. of oil per hour from Newcastle sand. Test was of the zone 7,846-60 ft. and flow was through open tubing. Total depth of the well is 7,930 ft. It is about 3 miles southwest of previous production, and is the most westerly discovery made in the current exploratory campaign in Weston County.

Weston County activity now accounts for more than 50 of the 300 rotaries active through the entire Rocky Mountain region, and interest in the southern portion of the county has spilled over into Niobrara County with a resultant increase in activity to a level considerably above that of recent years.

Dickie Unit Discovery Completed

Stanolind Oil & Gas Co. has completed 1 Unit, NW SW NW 25-45n-101w, first test of the Dickie Unit, Hot Springs County, for a gage of 290 bbl. of oil per day. Production is from Phosphoria and water cut over various testing periods has run from .1 to 20 per cent. The operator has a second well, 2 Unit, NE NE NE 26-45n-101w, now drilling below 1,050 ft.

NEBRASKA

Cheyenne County Discovery Indicated

Plains Exploration-Dunn & Boreing have recovered 280 ft. of heavily oil-cut mud and 200 ft. of water in 2-hour test of the "D" sand at 1 Hill, NE SW SW 4-15n-49w, Cheyenne County. The operator tested the interval 4,538-57 ft., and is drilling ahead below 4,557 ft.

CANADA

Three Discoveries Slated In Western Canada Area

Exploratory operations in western Canada during the past 7 days gave oil encouragement at three wells, and additional oil pay thickness at another pair of drillers that are either discoveries or extensions to previously discovered oil-bearing structures.

Among the wildcats that gave up initial oil this week is a well in the Denhart area of southern Alberta, 115 miles east-southeast of Calgary and 55 miles northwest of Medicine Hat, drilled by Flock Gas & Oil Corp., Ltd. This venture found its oil in the detrital section, just above the Madison limestone. As yet it has not been determined how thick the oil zone is, but 1-hour drill-stem test from 3,260 to 3,293 ft. gave a recovery of 2,270 ft. of medium-gravity crude oil and 180 ft. of salt water.

Hole was carried down to 3,313 ft., and test in the Madison, which was topped at 3,297 ft., yielded only water. String of 7-in. production casing is being run, and plans call for further testing of the well. Commercial prospects at the well will likely be known in the near future. Site is Flock-CPR 3-6-14 Denhart, LSD 6, 14-20-11w4.

Wimborne . . . Near the town of Wimborne, in central Alberta, 60 miles north-northeast of Calgary and 25 miles southeast of Red Deer, Socony-Vacuum Exploration Co. struck some light crude oil in the D2 Devonian limestone. As yet only one test result has been released, and formation water was also present when pipe was pulled.

A half-hour test in D2 interval 7,290 to 7,323 ft. flowed gas at maximum rate of 887,000 cu. ft. daily in 4 minutes, and gave up 570 ft. of approximate 41°-gravity oil and 60 ft. of sulfur water. Reaming at 7,345 ft. was under way at week's end, and hole was scheduled to go down in search of D3 reef. Only a thin productive section is indicated.

This well, Socony 14-11 Wimborne, LSD 11, 14-34-26w4, is ¾ of a mile north-northwest of the Socony-Gulf-Amerada 1 Wimborne wildcat that discovered a 1,000,000 cu. ft. per day gas flow in the D2 and found D3 reef water-loaded. It is 8 miles southwest of the Husky-Phillips 1 Pine Lake marginal D2 oil producer.

Cook Lake . . . Near Cook Lake, in the general Dodsland-Coleville region, unofficial reports indicate that Canada Southern Oils, Ltd., has found a showing of light gravity oil in the Viking sand.

The oil came at the Canadian Southern-Superior 11-32 Cook Lake well, LSD 11, 32-31-21w3. Site lies about 18 miles northeast of Kindersley and 3 miles southwest of a Dodsland area abandonment that found a small gas flow. No drill-stem tests or swab results that gave up oil have yet been reported by backers of the poject, but it is understood that initial tests have given oil encouragement, and that further testing is under way in an effort to determine whether commercial production will be possible.

North Pembina . . . At North Pembina some 60 miles southwest of Edmonton, the team of Socony-Vacuum, Seaboard, Honolulu, Merrill and Concoll have fully penetrated the Cardium sand, and have indicated an oil pay thickness of around 55 ft. This well, a discovery or extension to the Cardium strike 6¼ miles to the southwest, yielded 37.2°-gravity crude oil from the producing horizon.

The well, Socony-Seaboard 11-13 North Pembina, LSD 13, 11-49-8w5, entered the oil zone at 4,952 ft., and base of the sand is

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around 5,006 ft. String of production casing was run to 5,062 ft., and crew perforated and has commenced swabbing operations. Prospects for a sizable oil field at Pembina are in sight, particularly if the two producers so far drilled are on the same oil field structure.

The other probable extension is in the Sturgeon Lake (South) field in northwest Alberta, 175 miles northwest of Edmonton and 85 miles south of Peace River town. This well, Amerada Petroleum Corporation "Y" F 2-11 Crown, LSD 12, 11-69-22w5, is 4¾ miles southeast of the company's earlier D3 oil discovery well at southern Sturgeon.

By the weekend the "Y" F well had opened and tested 82 ft. of D3 oil pay zone, and was preparing to continue deepening. At bottom of last test this well had flowed 37°-gravity crude at rate 1,728 bbl. daily through a ⅜-in. choke.

The new producer entered D3 reef 103 ft. higher than the other producer in the immediate area, and may anticipate a sizable oil column. The first oil well in this southern sector of Sturgeon Lake indicated around 70 ft. of oil zone.

Eastern Canada . . . Imperial Oil, Ltd., has completed a wildcat discovery well about 30 miles east of Sarnia in western Ontario. The well flowed 130 to 140 bbl. of 30.4°-gravity oil daily. Three other wells are planned for the vicinity.

KENTUCKY

EASTERN KENTUCKY

In Big Sandy gas field, Kentucky-West Virginia Gas Co. have recently completed two good shallow gas producers. In Floyd County and located on Little Abbott Creek 1005 H. H. Hornsby gaged 1,783,000 cu. ft. of gas daily from the Maxon (Mississippian) sand at a total depth of 719 ft. Top of sand was encountered at 656 ft. On Rockhouse Creek in Pike County, same company 6104 Bowles & Ratliff was completed for 1,400,000 cu. ft. of gas from the Maxon sand 1,789 ft. to 1,905 ft. total depth. Both wells were completed natural.

OKLAHOMA

New Zone Stepout Being Completed in Elk City

Shell Oil Co. is finaling 1 Carter-Caughron, C SE NW 19-10n-21w, off the southwest flank of Elk City field in Beckham County. The well flowed 32 bbl. of oil with 1,701 M.c.f. of gas through 22/64-in. choke from perforations at 12,645-646 and 12,704-734 ft. in the Des Moines (Pennsylvanian) pay, topped at 11,460 ft.

Sixth Consecutive Producer

A sixth consecutive producer in southwest Navina pool, Logan County, and the second in the Simpson dolomite zone was announced by Macmillan Petroleum Corp., Blackwood and Nichols & Richard S. Rheem, when their 1 Shields, located ½ mile southeast of discovery well, The 1 Krout, flowed at the rate of 30 bbl. of 39°-gravity oil for 2½ hours on ½-in. choke, then 15 bbl. an hour of clean oil or at the rate of 360 bbl. a day on a 26/64-in. choke.

Production was from an interval of 6,430 to 6,452 ft. or 22 ft. out of the total of 70 ft. of known dolomite. Following additional tests the well will be shut in for a brief period to allow for tank erection.

Officials of the successful combination said the completion of this well proved a considerable area of commercial production in the dolomite zone of this field. The first dolomite production was from the 1 Berg, north of discovery well, the 1 Krout.

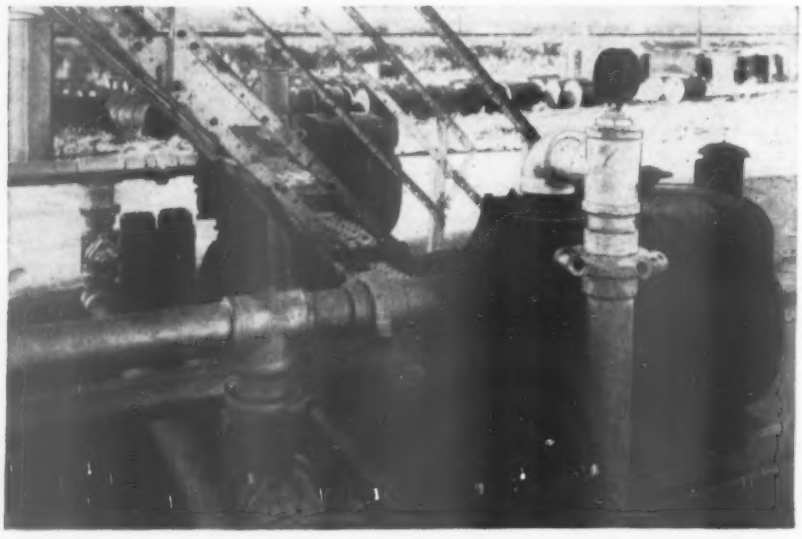
West Sealy Confirmation Reports Good Flow of Oil

Magnolia Petroleum Co. 1 Lawson Bull unit, C NE NE 8-5n-2w, confirmation well to new West Sealy pool in the southern part of McClain County, flowed 227 bbl. of oil in 18 hours through 18/64-in. choke. The oil is 42° gravity. Testing is still under way. The flow came from perforations at 8,392-8,419 ft.

West Sealy pool was opened by Magnolia at 1 Gladys Love, SW SW 4-5n-2w, for a flow of 325 bbl. of oil per day through ½-in. tubing choke. The same company is beginning operations at 1 Robinson in the C SE SE 8.

Cleveland Discovery Flows At Good Hourly Rate

Ashland Oil & Refining Co. 1 Nance, SW SE NW 19-7n-1e, Cleveland County Wilcox sand discovery, flowed 20 bbl. of oil per hour on a 40/64-in. choke on first production test from perforations at 6,989-91 ft. The pool opener is located about 2½ miles southwest of North Halsel pool.



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LOUISIANA

NORTH LOUISIANA

Testing Reveals New Wilcox Well in LaSalle

Hunt Oil Co. and Gulf Refining Co. are waiting on storage tanks for further testing at 91 Louisiana Delta Hardwood Lumber Co., Inc., C NE SW 33-6n-4e, new Wilcox oil discovery 3¼ miles south-southwest of old Elm Ridge field in LaSalle Parish.

The discovery tested an estimated 135 bbl. of oil per day through ⅜-in. top and ⅝-in. bottom chokes on drill-stem test tool. The oil came from perforations at 4,742-46 ft. in one of three Wilcox stringer sands.

SOUTH LOUISIANA

Second Pay Zone Opened In New West Delta Field

Continental Oil Co. has proved another pay zone, the second, for its recently opened West Delta Block 53 field off the coast of Plaquemines Parish, where its 1 State Lease 979 is being completed as a sizable oil producer in a sand open through casing perforations at 10,213-222 ft.

During a 4-hour test through 8 64-in. choke, the new well flowed at the rate of 360 bbl. of 33.3°-gravity oil per day. Production during a later 4-hour test through 10 64-in. choke was at the rate of 490 bbl. per day. Flowing pressure gaged 2,250 psi. with gas-oil ratio at 643 cu. ft. per barrel.

Continental's discovery well, 1 State Lease 978, completed last June, produces from a sand at 6,370-88 ft. However, before completion in that sand, the well had tested oil production in at least three other deeper sands. Since the discovery well's completion, two dry holes have been drilled.

Sorrento Outpost Opens Production in New Sand

A new, deep pay zone for the Sorrento dome, in Ascension Parish, has been opened by The Texas Co. with the completion of a gas-distillate producer at its 22 United Lands Co., a semiwildcat located a mile northeast of nearest previous production on the dome.

During initial tests, the well flowed 32 bbl. of 44.4°-gravity distillate per day with gas volume estimated at 3,154,000 cu. ft. of gas per day. Flow was through 20 64-in. choke with 3,700-psi. pressure. Pay is from a casing-perforated interval at 10,248-74 ft. in hole drilled to 10,754 ft.

Sorrento, one of the earlier geophysically discovered salt domes on the Louisiana coast, has been productive since early in 1928. Production originally was from shallow cap rock and overlying sands, but has been extended gradually to steadily deeper flanking sands around the dome.

Deep Development Yields Third Well at Bay Junop

Exploration of deep sands off the north side of Bay Junop dome, in Terrebonne Parish, has resulted in the completion of another gas-distillate producer, the third for the dome. This new well, The Texas Co. 4 State Lease 725-Bay Junop Unit 3, producing from casing perforations at 13,792-800 ft., confirms the pay-zone discovery made in the company's second well, Unit 3, completed last July. The dome's discovery well, 2 Unit 3, completed last January, produces from a slightly shallower pay at 12,666-82 ft.

Initial production of the new well was at the rate of 84 bbl. of 46.1°-gravity distillate per day through 9 64-in. choke with gas volume at the rate of 28,100 cu. ft. per barrel of distillate. Production of the discovery well of the deeper sand was at the rate of 276 bbl. per day.

Development of these deep sands is rewarding more than 24 years of exploration on and around this dome, originally leased by The Texas Co. from Louisiana Land & Exploration Co. in 1928.

INDIANA

Elmer Novak and Aaron Karchmer have set casing at 1 Fuhrman, 13-1s-5w, 3 miles northeast of Jasper in Dubois County, the first Cypress pay in the county. Testing recovered 150 ft. gas, 5 ft. clean oil, 5 ft. of oil-cut mud, and no water with bottom hole pressure 48 psi. This wildcat is 5 miles from other production.

CALIFORNIA

New Torrey Canyon Pool Indicated

The Texas Co. has set pipe in its wildcat ¾ mile west of Torrey Canyon field near Piru in Ventura County. It is expected the test, 2 Hunter in NE NE 6-3n-18w, will make a small producer in the Sespe zone at about 6,437-7,540 ft. Since this production is about

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2,500 ft. shallower than in Union Oil Co. deep-Sespe producers in the field proper, it would be a new fault-block discovery if successful. This is the company's second test in the area; 1 Hunter, about ¼ mile south, failed to find deep Sespe production.

New Cat Canyon Oil Discovery

Slick-Moorman Production Co. completed its 1-C Palmer-Stendel as a new fault-block pool discovery in SE NE 24-9n-33w, 1 mile northeast of West Cat Canyon field, in Santa Barbara County. Initial production from the 2,390-2,780 ft. lower chert zone, middle Miocene, was about 30 bbl. daily of 10°-gravity crude. Pumping was required but no heat or diluent was needed. The operator's 44-A Palmer-Stendel, a north offset, was testing the new zone after being redrilled to 2,800 ft. in June. It has been completed in the Sisquoc zone at 2,353-2,533 ft. as a new field discovery.

Reserve Completing New Discovery at Pyramid Hills

Reserve Oil & Gas Co. was in process of completing its wildcat at Pyramid Hills, Kings County, as a large, light-gravity oil producer. On a formation test at 4,390-4,408 ft. the well flowed at a rate of 1,000 bbl. daily with a ¼-in. choke on bottom and a ½-in. surface choke. When the latter was reduced to 20/64-in., estimated production was at the rate of 500 bbl. daily. No water accompanied the flow of 40-42°-gravity crude.

The wildcat, 48-20 Orchard, is in SE SW 20-24s-18e, approximately ¾ mile south of Pyramid Hills production. Hole was drilled to 5,237 ft. but was plugged back to 4,429 ft. after setting 5½-in. casing at 4,565 ft. Production is believed to be from the third Kreyenhagen sand, Oligocene age. An earlier test at 4,008-73 ft. indicated the second Kreyenhagen sand would produce gas and condensate.

Reserve has a lease block of 1,060 acres in the vicinity of the wildcat. Of this 480 acres is 100 per cent held and the remainder is 50 per cent held with Franco Western Oil Co. and Norris Oil Co.

Guadalupe Discovery Is Indicated

General Petroleum Corp. was continuing to pump-test its potential new field discovery 3 miles south of the Guadalupe field in coastal San Luis Obispo County. With combination casing landed on bottom at 4,501 ft., 1 Mahoney pumped about 277 bbl. gross daily from the interval below 4,098 ft. The low-gravity crude production included 125 bbl. of diluent and 30 bbl. of water. Location of 1 Mahoney is in NW SW 9-10n-35w.

Coalinga Discovery Being Offset

Southwest and northwest offsets were under way to the new Coalinga-Harnish field 1 mile south of Pleasant Valley field in Fresno County. Lloyd Harnish, Operator 64 "Well" and Russell Giffen 62-32-F, both in 32-20s-16e, were the new tests. The discovery, in the Leda sand of lower Miocene age at about 8,400 ft., was producing 346 bbl. of 37°-gravity crude through a 12/64-in. choke.

Two Oxnard Tests Staked

Lloyd Corp., Inc., has staked location for a ½-mile outpost to the one-well McInnes pool at Oxnard, Ventura County, and Standard Oil Co. of California was grading location for a 1½-mile southwest outpost. The latter was 1 Lucas in 12-1n-22w. Lloyd 1 W. R. Livingston will be drilled in 31-2n-21w, about midway between the discovery and Standard 1 Scholle-Livingston. The latter was in process of being completed in the 6,300-ft. Sespe pool discovered by Standard 1 McInnes last July.

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MICHIGAN

Traverse oil shows were reported on drill-stem test at the Don Rayburn 1 Myer, N½ NE SE 25-20n-3w, Franklin Township, Clare County, a wildcat which is scheduled to drill to the Richfield. Top of Traverse lime was logged at 3,077-77 ft. First drill-stem test was run for 1 hour at 3,165-15 ft. Gas showed to surface in 14 minutes and hole carried 150 ft. of clean, water-free oil at the conclusion of the test. Second drill-stem test, run for an hour at 3,105-35 ft. showed about 2,100 ft. of salt water, plus a quantity of oil and gas-cut mud. Gas, on this second test, showed at the surface in 40 minutes.

One of the most interesting current wildcat tests in western Michigan this week is the James J. McGerry, Trustee 1 Honrich, NW SE NW 33-8n-13w, Wright Township, Ottawa County. Although a good evaluation of this wildcat can not be made on the basis of known information, it was known, however, that hole carried about 1,800 ft. of fluid, about one-third water, on a 48-hour fill-up

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test. Top of Traverse lime was logged at 1,919 ft. and pay showed at 1,920-21 ft. Well was under test at that point this week. This wildcat is located about 4 miles northwest of the extreme northwest edge of big Walker Traverse oil pool. It appears very likely that this wildcat, regardless of its eventual outcome, will prompt additional exploration and development in this area.

An encouraging quantity of free oil and gas was reported showing after Detroit River zone oil pays were perforated at the Don Rayburn 1 Lounsbury-Perry et al, SW SW SW 31-14n-11e, Elkland Township wildcat, Tuscola County. Five Detroit River porosity zones were each perforated with 24 shots. Zones shot were at: 3,043-49; 3,083-89; 3,147-53; and at 3,249-54 ft. Some water was in evidence, and from a study of log survey it was determined to be showing from the 3,083-89 ft. perforations. These openings were being squeeze-cemented off before additional tests were to be run. Wildcat was bottomed out at 3,541 ft., plugged back to 3,343 ft. and 5-in. casing was cemented in at 3,350 ft.

TEXAS

WEST TEXAS

Hunt Amacker Test Makes Heavy Flow of Oil

Upton County had another flowing discovery at Hunt Oil Co. 1 V. T. Amacker, scheduled 13,500-ft. wildcat in 106-DCCSD&RGNG Survey, 5 miles southeast of Wilshire field. (See accompanying map).

First drill-stem test, identified as the lower Wolfcamp, from 8,844-8,933 ft., had gas in 3 minutes, mud in 10 and oil in 13 minutes. It was turned into pits for the balance of the 30-minute test. Estimates on the rate of flow ranged from 40-75 bbl. hourly. Flowing pressure ranged from 3,125-3,400 psi. and 20-minute shut-in pressure reached 3,700 psi. Operators were drilling ahead below 8,976 ft. at last report.

Northwest of Wilshire field, Gulf Oil Corp. 1-AE TXL was coring below 9,320 ft. in lime and shale, following a second drill-stem test in the Pennsylvanian. First test between 9,170-9,220 ft. tanked 204 bbl. of clean oil in 3 hours. Second test, at 9,218-70 ft. recovered 130 ft. of slightly gas-cut mud. Projected depth was 13,000 ft. Gardner Brothers Drilling Co. has contract.

Gulf 3 McElroy Ranch, extension and new pay discovery in Adamc Devonian field, was reaming down core hole in the Ellenburger to 11,870 ft. Drill-stem tests developed a small amount of drilling mud with no shows between 11,765-11,820 ft., and 40 ft. of slightly gas-cut mud with a trace of oil from 11,820-11,870 ft.

The 3 McElroy Ranch flowed discovery oil on three consecutive tests in the Fusselman between 10,472-10,674 ft., recovered oil in Simpson sand from 11,428-11,443 ft., and also in the Ellenburger between 11,625-11,699 ft.

Andrews County . . . Sohio Petroleum Co. will drill its 1-A David Fasken to 14,000 ft. to test the Ellenburger. Location is a southeast outpost to wells in the C Ranch Devonian pool in the eastern part of the county. Nearest Ellenburger oil is 4½ miles to the northwest in Magutex field. Operators were drilling below 12,860 ft. at last report.

Anderson-Prichard Oil Corp. 1-I University, Ellenburger discovery on the southeast side of Prichard-Devonian field, was running potential tests. One gage of 19 hours tanked 557 bbl. of oil through ¼-in. choke. Pay section was open hole between 13,475-13,487 ft.

Phillips Petroleum Co. 1-WW University, northwest extension to Northeast Andrews pool, flowed oil, mud and water on a test the Devonian from 12,514-12,657 ft. Fluid reached the surface in 85 minutes, which included some oil at the end of 3½ hours. After cleaning into pits for 28 minutes, the well made 9 bbl. of oil and 12 bbl. of water in 40 minutes.

Sinclair Oil & Gas Co. has filed application to drill an Ellenburger wildcat approximately 2 miles southwest of Anderson-Prichard & Cowden, recent opener of Ellenburger production on the west side of Emma pool, south Andrews County. Location will

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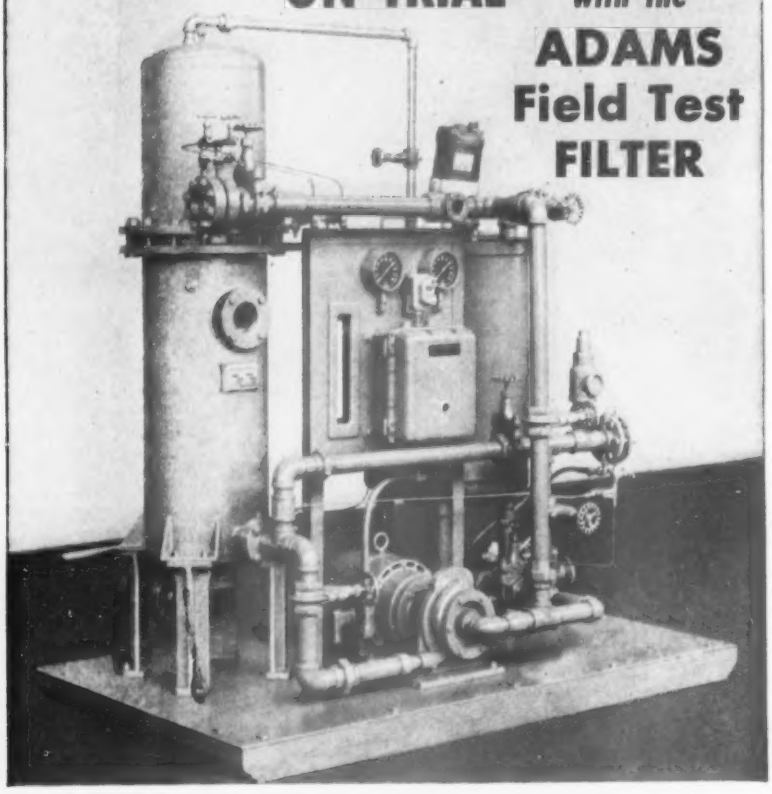

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be in 3-44-T2N-T&P Survey, No. 8 Cowden flowed 569 bbl of oil a day from pay between 12,295-12,343 ft.

New reef discovery . . . The Texas Co. 1-B Clayton, northeast extension to Good field, on discovery of a new reef structure, had flowing oil on drill-stem test between 8,093-8,115 ft. Oil reached the surface in 70 minutes, then tanked 5 bbl. in 30 minutes. Second test, from 8,075-95 ft., open 6 hours and 45 minutes, developed 200 ft. of heavily oil and gas-cut mud. Third test, from 8,093-8,115 ft., had gas in 5 minutes and oil in 70 minutes. It then flowed 18 bbl. of oil in 2 hours. Operators prepared to drill ahead. Sample top on the reef was 8,075 ft. on elevation of 2,529 ft.

TEXAS GULF COAST

Jackson Wildcat Proves Gas-Distillate Producer

Alcoa Mining Co. and Crown Central Petroleum Co., joint operators, have a new gas-distillate discovery in southeastern Jackson County, where their 1 Appling, in the S. C. Lyons Survey, flowed at the rate of 3,000,000 cu. ft. of gas and 90 bbl. of 55°-gravity distillate per day on pre-potential tests through 14/64-in. choke. Casing is perforated in a sand at 8,498-8,508 ft. with hole having been drilled to 9,972 ft. Location is 6 miles south of LaWard.

New Gas-Distillate Field Opened in Harris County

A new gas-distillate producing area, located 2¾ miles southeast of production on the old Humble dome, northern Harris County, has been opened with the completion by Russell Maguire of his 1 Dooley, in the Victor Blanco Survey.

On open flow potential test, the well produced at the rate of 7,000,000 cu. ft. of gas daily, spraying 52.8°-gravity distillate with a gas-distillate ratio of 26,172 cu. ft. per barrel. Shut-in pressure gaged 3,330 psi. Production is from sand, opposite which casing is perforated at 8,928½-31½ ft. Total depth is 9,001 ft.

Location is 5½ miles southeast of the town of Humble.

TEXAS PANHANDLE

Casing Being Run at Hansford Gas Discovery

Humble Oil & Refining Co. is running casing at 1 S. P. and K. K. Jackson, Section 111, Block 45, H&TC Survey, 3½ miles north of Hansford and 10 miles southeast of Hugoton field Permian gas production in the central part of Hansford County.

A 30-minute drill-stem test flowed 6,125 M.c.f. of gas per day while tool was open. The gas flowed from 4,967-5,000 ft.

The Texas Co. 1 Blakemore, Section 30, Block 4-T, T&NO Survey, 10 miles northeast of Hansford and 20 miles southeast of Hugoton gas production, was waiting on potential as another Anadarko basin discovery after flowing 6,580 M.c.f. of gas per day following treatment of Morrow sand perforations at 7,298-7,308 and 7,356-70 ft. This well is 10 miles east of Humble's discovery.

NORTH TEXAS

Heavy Flow in Young County

Larson & Thomas 1-C Hall, 3½ miles southeast of Graham, was temporarily out of control while pulling drill pipe after testing in conglomerate at 4,172-82 ft. The well started unloading, then blew mud and fluid over the derrick and made gas for 24 hours, then began blowing a steady 10-in. stream of oil, according to field reports.

New Pay Flows Oil In Sherman Pool

The Sherman pool 1 mile north of Sherman, Grayson County, was given a new and deeper pay section at Standard Oil Co. of Texas 7 H. L. Rising. It is the first Oil Creek production in that area.

Operators drilled to 9,675 ft. and perforated between 9,585-9,606 ft. On a 6-hour test the well made a calculated 2,310 M.f.g. per day and 210 bbl. of oil through 12/64-in. choke. A later 12-hour test tanked 240 bbl. of oil.

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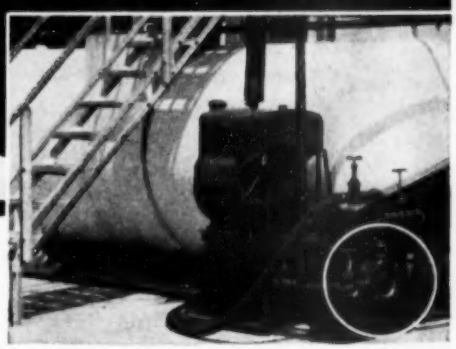

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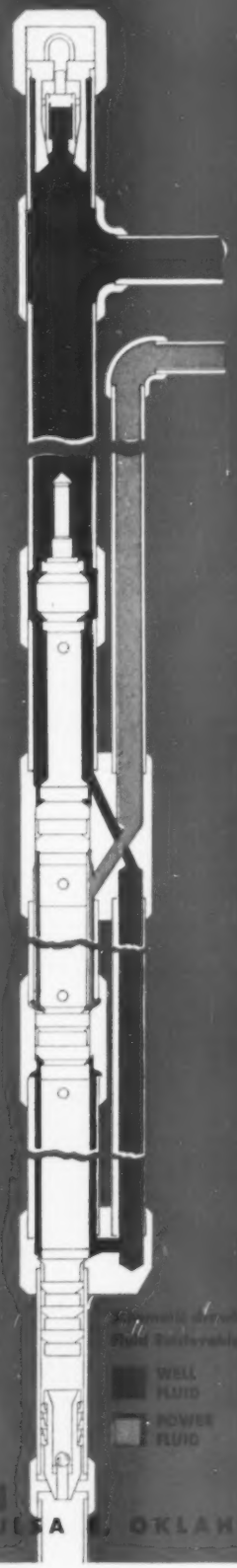

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with choke size unreported. It was shut in for completion tests.

Howell, Holloway & Howell 1 Anderson, wildcat 2 miles southwest of Whitesboro, was plugged back to 5,197 ft. for further testing. After drilling to the Ellenburger at 5,238 ft., operators swabbed 14 bbl. of oil in 11 hours, treated and swabbed 103 bbl. of load oil and 16 bbl. of new oil in 12 hours.

Fisher Discovery Completed

Trans-Tex Drilling Co. 1 York, Fisher County discovery 4 miles northwest of Hamlin, completed for a flowing potential of 201.7 bbl. of 40°-oil a day from perforations between 4,481-87 and 4,554-68 ft. Total depth was 5,539 ft.

NEW MEXICO

SOUTHEAST NEW MEXICO

Depth Record Set in Eddy County

Richardson & Bass 1 Harris-Federal, Delaware basin test in 12-25s-30e, reached a new depth record for Southeast New Mexico when it stopped drilling at 16,705 ft. That depth was 246 ft. deeper than the same firm's 1 George H. Cobb-Federal, 25 miles to the north, and also 9 ft. deeper than West Texas' record holder drilled by Gulf Oil Corp. in Reeves County.

Operators ran electrical surveys but had not reached formation tops below the Bone Springs at 7,889 ft., minus 4,511 ft. Total depth apparently was still in the Wolfcamp.

Operators plugged back to 12,343 ft. and prepared to perforate casing between 12,320-12,335 ft. This section, on a 2-hour test, had a flow of gas and distillate in 49 minutes, then flowed 8.28 bbl. of 55° distillate in 1 hour. Another gage reported was 1,527,000 cu. ft. of gas in 1 hour through ⅜-in. choke, plus 4 bbl. of distillate.

Roosevelt County . . . Amerada Petroleum Corp. will drill a 10,000-ft. wildcat 12½ miles southeast of Kenna, as 1-C Federal in SE SE 10-7s-32e. Location is 10 miles directly east of Forest Oil Corp. 1 Federal-General American, Pennsylvanian discovery.

In east-central Lea County, Forest Oil Corp. and Houston Oil Co. 1 State, 26-13s-17e, approximately 1 mile northwest of a Wolfcamp discovery, developed salt water on drill-tem test of the Devonian from 13,400-95 ft. and probably will be abandoned.

The Teague-Ellenburger had a southeast extension at Amon Carter 5-E Hill, 35-23s-37e, which had prospects of a 150-ft. pay section on the basis of drill-stem tests. Flow tests ranged from 46-55 bbl. hourly on sections between 9,580-9,730 ft.

MISSISSIPPI

Pennsylvanian Oil Shows Encountered at Muldon

Showings of high-gravity oil encountered by Union Producing Co. while drilling in the Pennsylvanian section at its 1-A Ott Unit, in Muldon field, Monroe County, have stirred speculation that another discovery may be in the making for the Black Warrior basin of northeastern Mississippi and northwestern Alabama.

So far, except for one recently oil-discovery well completed in Knox dolomite of Ordovician-Cambrian age, all production in the Black Warrior basin has been from the Mississippian-Chester, and has consisted of gas-distillate.

Source of the showings in Union's Muldon well has not been determined. Oil appeared on the pits while the well was drilling below 3,850 ft., in the Pennsylvanian. Drilling was stopped at a total depth of 3,889 ft. for an electric log and drill-stem tests. Attempts to test, as this is written, have proved unsuccessful, but are being continued. Mississippian gas-distillate production at Muldon is obtained at depths of 5,400-5,500 ft.

APPALACHIAN AREA

WEST VIRGINIA

In Union district, Clay County, West Virginia, United Fuel Gas Co. 8000-T Fee, deep wildcat test, elevation 1,227 ft., will be plugged as a dry hole on account of water encountered in the Clinton sand, Corniferous lime 5',598-5,737 ft., Oriskany sand 5,737-5,795 ft., Newberry 6,635-6,675 ft., Clinton sand 7,415-7,489 ft., gas and water 7,466-7,472 ft., TD 8,144 ft. Roaring Creek district, Randolph County, four wells are shut down and will be sand-fraced in the Fifth sand. They are Blaho Oil & Gas Co. 1 E. & M. Joyce estate, 1 Avington & King, and 1 H. E. Harshbarger. Seneca Oil & Gas Co. 2 West Virginia Coal & Coke Corp., will undergo the same treatment. Triadelphia district, Logan County, Hope Natural Gas Co., 9826 McDonald Land Co., resulted in a large volume of gas testing 12,740,000 cu. ft., Big lime 3,224 ft., gas 3,426 ft., TD 3,434 ft.

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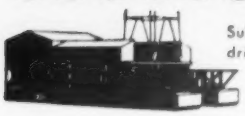

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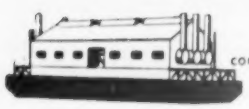

Boiler and compressor barges

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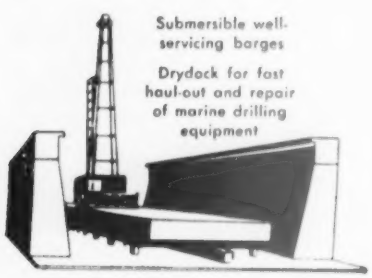

Submersible well-servicing barges

Drydock for fast haul-out and repair of marine drilling equipment

Levingston is not only located conveniently with respect to marine drilling operations on the Gulf Coast, but here you will find marine engineers and constructors who understand the language of oil operators. Bring your marine petroleum equipment problems to Levingston *first* for a quick economical solution.

Levingston

SHIPBUILDING CO.

Orange, Texas

Township, Coshocton County, were completed during the week. W. B. Weed 1 (2) Nettie McFarland, Lot 13, made a fair show of oil natural in Clinton, found at 3,187-3,243 ft., and 70 bbl. in 24 hours after fracturing. The W. E. Shrider 2 (5) Frazee, 3rd Qr., with sand at 3,202-3,258 ft., made 4 bbl. natural and 75 bbl. in 24 hours after fracturing.

Along the east side of Butler Township, Knox County, Mammoth Drilling Co. 1 (5) Oscar Rodgers, Section 20, filled 1,200 ft. while drilling-in, and increased to 110 bbl. in 24 hours after fracture treatment.

Two wells were completed in Mt. Zion pool in Jackson Township, Knox County: National Gas Co. 6 Jewell, Section 25, with sand at 2,951-3,006 ft., made 56 bbl. daily after Hydrofrac and the C. A. Davis 6 Harris, Section 18, with sand at 2,939-2,983 ft. made 40 bbl. in 24 hours after Sandfrac.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Duval County: Great Western Oil & Gas Co. 1 Allen, Share 6, Las Anacuas Grant, A-627. Dry. TD 6,329 ft.

The Texas Co. 1-A DCRC NCT-17, Sec. 102, W. D. Roach Sur., A-1965. IPP 58.2 BOPD, 22.2°, casing perforations 1,956-70 ft. TD 3,511 ft. (New field—Brelum.)

Frio County: Howeth & Mason 1 Maggie Harkness estate, C. Myer Sur., 168, A-504. Dry. TD 3,612 ft.

Midstates Oil Corp. 1-A Dixon, M. A. Gardner Sur. 13½, A-354. Dry. TD 2,895 ft.

Jim Hogg County: H. L. Hunt 1-A Silver Lakes Ranches, Inc., BS & F Sur. 161, A-176. IP 86.9 BOPD, 3/16-in., 46°, Pettus sand 4,242-48 ft. (casing perforations). TD 5,454 ft. (New field—Norricitas Creek.)

Pratt-Hewitt Oil Corp. 1 Isidro Vela, Blk. 35, Survey 588, El Peyote Grant. Dry. TD 2,745 ft.

Kenedy County: Humble Oil & Refining Co. 2-G J. G. Kenedy, Jr., Pasadizo Pasture, La Parra Grant. Dry. TD 8,001 ft.

McMullen County: Stanolind Oil & Gas Co. 1-C Hagist Ranch, H & TC Sur. 8, A-1164. Dry. TD 9,545 ft.

Nueces County: Alaska Steamship Co. and Texita Oil Co. 1 Mastin, Branniger Brothers Subd., Clarkson Ranch. Dry. TD 6,599 ft.

W. Earl Rowe and Petrocel 1 Frank Willoughby estate, Parcel "G," Share 4, San Antonio de Alamo Grant, A. S. Groves Sur., A-908. Dry. TD 8,012 ft.

San Patricio County: Billy Bridewell 1 W. I. Lewis estate, Sec. 10, G. H. Paul Subd., Coleman-Fulton Pasture. Dry. TD 7,310 ft.

Seaboard Oil Co. of Delaware 1 Spessard, C. C. Hornsby Sur., A-159. Dry. TD 8,001 ft.

Superior Oil Co. 1-4 Minnie Welder, Sec. 4, Welder Ranch Subd. Dry. TD 8,950 ft.

Starr County: Clark Fuel Producing Co. 2 Salinas, Sec. 25, S. D. Leonard Subd., La Sacatosa Grant. Dry. TD 2,384½ ft.

Magnolia Petroleum Co. 19 Coffield, Share 1, El Javali Grant. Dry. TD 2,005 ft.

Webb County: Blanco Oil Co. and Killam & Hurd 2 Garcia estate, HE & WT Sur. 463, A-1473. Dry. TD 2,510 ft.

TEXAS GULF COAST

Bee County: Christie Hewit and James R. Dougherty estate, 6-C Roche, Timothy Hart Sur., A-29. Dry. TD 5,450 ft.

Louis Haring, Jr., and Kirkwood & Morgan, Inc., 2 O'Connor, Phoebe Crain Sur., A-61. Dry. TD 4,407 ft.

Renwar Oil Corp. 8 McCoy estate, T. Simmons Sur., A-292. Dry. TD 4,407 ft.

Calhoun County: Vaughn, Zoch & Turnbull 1 Duncan, W. M. Lewis Sur., A-107. Dry. TD 3,907 ft.

Fayette County: Bankline Oil Co. 1 Novak, M. Muldoon Sur. 13, A-75. Dry. TD 4,180 ft.

Forney & Winn 1 Kelso, Alma Weaver Sur., A-337. Dry. TD 2,234 ft.

Fort Bend County: Charles B. Wrightsman 1 Riverside, J. W. Scott Sur., A-321. Dry. TD 8,052 ft.

Galveston County: Placid Oil Co. et al. 1 Crane Gas Unit 1, Lot 137, E. P. Mitchell Sur., A-149. Dry. TD 9,573 ft.

The Texas Co. 1 Braslu, W. G. Banks Sur., A-36. Junked hole. TD 9,800 ft.

Goliad County: American Republics Corp. 1 Johnson et al, Ramon Musquez Sur., A-29. IP 9,000 M.c.f. daily, open flow, Luling zone 7,575-87 ft. (casing perforations). TD 7,750 ft. (Extends Charco field.)

Hardin County: General Crude Oil Co. 1 Hooks et al, Wiley G. Powell Sur., A-425. Dry. TD 8,315 ft.

Harris County: Russell Maguire 1 Dooley, Lot 7, Dooley Subd., Victor Blanco Sur., A-2. IP 7,000 M.c.f. daily, open flow, casing perforations 8,928½-31½ ft. TD 9,001 ft. (New field.)

Jackson County: Corley & Geiselman 1 Ranch, I & GN Sur. 29, A-170. Dry. TD 9,205 ft.

Salt Dome Production Co. 1 Branting & Swanson, Sec. 15, Ramon Musquez Sur., A-59. Dry. TD 7,415 ft.

Karnes County: Jake L. Hamon and Edwin L. Cox 1-A Thigpen, Luz Navarette Sur., A-216. Dry. TD 7,387 ft.

Lee County: Brazos Oil & Gas Co. and E. W. Brown 1 Brade, Alfred White Sur., A-343. IPP 11 BOPD, 18.1°, casing perforations 2,877-79 ft. TD 5,979 ft. (New field.)

Sun Oil Co. 1 R. F. Melde estate, Franz Potthast Sur. Dry. TD 6,910 ft.

Liberty County: General Crude Oil Co. 1 Foster, Ann Holshousen Sur., A-208. Dry. TD 6,602 ft.

Live Oak County: Henderson Coquat et al 1 Marsden, Dennis McGowan Sur., A-29. IP 20 BOPD (by heads), ¼-in., 34°, Luling zone 7,542-57 ft. (casing perforations). TD 8,515 ft. (New field—Marsden.)

Matagorda County: Ada Oil Co. 1 Huebner et al, Peter Bertrand Sur., A-5 (South Lucky area). Dry. TD 9,516 ft.

Panhandle Refining Co. 1 Zipprian Unit, Luke Lessassier Sur., A-58. Dry. TD 6,135 ft.

Montgomery County: Gabriel Oil Co. and Morris K. Womack 1 Foster estate, Abraham Pevehouse Sur. Dry. TD 7,011 ft.

Petroleum Management Co. 1 Shands & Jones, William Rankin Sur., A-30. Dry. TD 7,120 ft.

Victoria County: Alaska Steamship Co., Newman Brothers Drilling Co., and H. L. Rymal 1-B Henderson-Pickering, J. M. Brownson Sur., A-384. Dry. TD 7,500 ft.

EAST TEXAS

Bowie County: Jack L. Phillips 1 Bostain, M. A. Poer Sur. Dry. TD 4,500 ft.

Camp County: Wm. D. McBee 1 H. G. Harley, Samuel Sexton Sur., A-106, 3 miles SE Newsome. IP 261 BOPD, ¼-in., TP 145 psi., Pittsburg sand 8,183-8,220 ft. TD 8,242 ft.

Panola County: Clark & O'Ferrall 1 A. M. George, John McAdams Sur., A-422. Dry. TD 2,640 ft.

WEST CENTRAL TEXAS

Brown County: Clark & Cowden Production

THE OLD DUTCHMEN SAID:

„De Cost gaet voor de Baet uit"

(THE EXPENSES PRECEDE THE PROFIT!)

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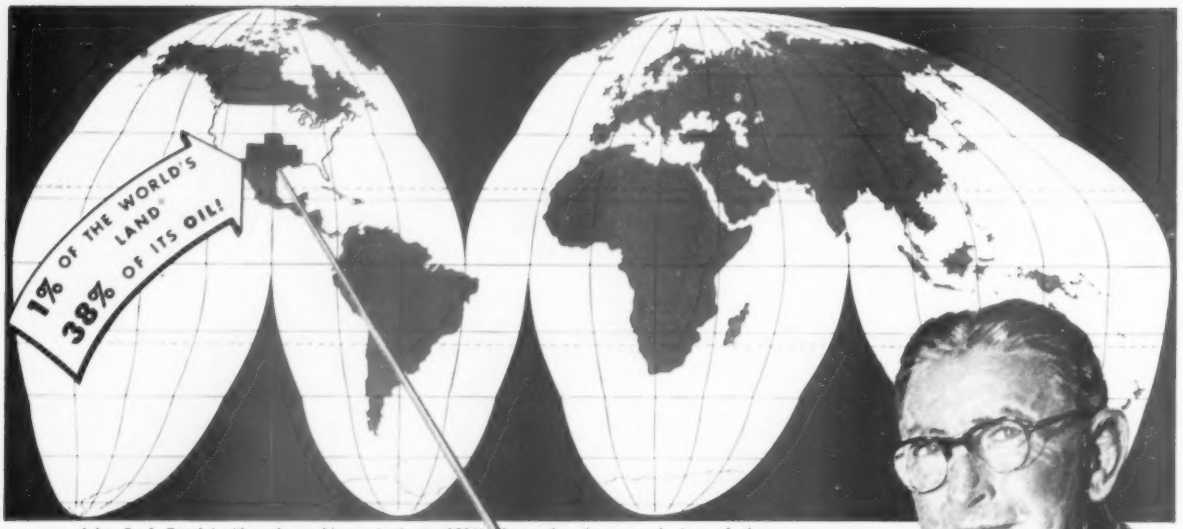

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Oil and Gas Division. Our Oil and Gas Division is staffed by graduate petroleum engineers and geologists whose specialized knowledge is at your service at all times. This department subscribes to the oil and gas reports, journals, reports on wells drilled . . . maintains up-to-the-minute statistical files on oil and gas operations . . . has available complete sets of field maps, county maps, etc. All of this data is available to customers. A valuable service is rendered to customers through a bank-by-mail attention to their loans, by furnishing them complete single-page records of run incomes from their wells balanced against note requirements and disposition of excess funds. This service saves time in record-keeping.

The Collection Department of the bank is used extensively by oil and gas men. This department accepts drafts with leases and assignments attached for presentation to the oil companies, and acts as a clearing house for lease brokers in assembling blocks and as agent for major oil companies.

The Mail Deposit Department renders a valued service to oil and gas customers. This department accepts royalty and working interest run checks for deposit to individual accounts, mailing run statements along with duplicate deposit slips, saving the customer many trips to the bank.

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*7 Southwestern states, comprising approximately 1% of the world's land area, produce nearly two-fifths of its petroleum supply. Results:

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- Petroleum is the Southwest's *main* business.
- Houston is the world's *leading* oil city.
- Port of Houston, in tonnage, is the world's leading oil port and the nation's second port.

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CAPITAL AND SURPLUS 15 MILLION DOLLARS

Member Federal Deposit Insurance Corporation

WILDCAT COMPLETIONS

Co. 1 Porter Davis, Sec. 36, Comal CSL. Dry. TD 2,475 ft.

Callahan County: Cosden Petroleum Corp. 1 TXL, 13-6-SPRR. Dry. TD 4,892 ft.

Creel and Carpenter 1 Chaney, Sec. 360, G. W. Denton Sur. 360. Dry. TD 1,737 ft.

Eastland County: Garland Anthony 1 Duncan, Blk. 7, H. Kendrick Sur. Dry. TD 3,764 ft., Ellenburger 3,538 ft.

W. W. Davis 1 R. O. Jackson, James Jett Sur., Subd. 17. Dry. TD 3,100 ft.

Urice Drilling Co. 1 Harry F. and Ada Finks, 25-2-ETRR. Dry. TD 1,823 ft.

Fisher County: Allison & Prestridge 1 W. J. Harvey, 3-20-T&P. Dry. TD 6,424 ft.

Great Lakes Carbon Co. 1 A. H. Hockley, Austin & Williams Sur. 355. Dry. TD 3,220 ft.

Haskell County: Crown Central Petroleum Corp. 1 Giles Kemp, 46-1-H&TC. Dry. TD 5,780 ft.

Edgar Davis Drilling Co. 1 F. W. Schoenstedt, 1-2-H&TC. Dry. TD 5,805 ft.

Jones County: Chupp & Tunnell 1 Buster Jones, 2-16-T&P. Dry. TD 2,798 ft.

Sojourner Drilling Co. 1 Elmon Rogers, Louis Kratz Sur. 335. Dry. TD 3,312 ft.

Nolan County: Big Spring Exploration Co. 1 G. B. Sliger, 207-64-H&TC. Dry. TD 5,943 ft., elev. 2,097 ft., Ellenburger 5,810 ft.

British American Oil Producing Co. 1-G Wilson estate, 216-64-H&TC. Dry. TD 6,069 ft., elev. 2,366 ft., Ellenburger 5,930 ft.

Midland Gasoline Co. 1 C. E. Boyd, 71-20-T&P. Dry. TD 6,592 ft., elev. 2,461 ft., Ellenburger 6,138 ft.

Texas Pacific Coal & Oil Co. 1 Mrs. S. E. Herndon, Acct. 2, Sec. 297, R. W. Whitehead Sur. Dry. TD 6,282 ft.

Stonewall County: Shamrock Oil & Gas Corp. 1 Abernathy, 23-D-H&TC. Dry. TD 6,560 ft., elev. 1,717 ft., Ellenburger 6,317 ft.

H. L. Hunt 1 Beulah Branch, 341-2-H&TC. Dry. TD 6,574 ft.

Jones & Stasney 1-A Flowers, Sec. 9, Blk. A, Arnold & Barnett Sur. Dry. TD 6,520 ft.

NORTH TEXAS

Archer County: Archer Drilling & Production Co. 2 Turbeville, T. P. Glass Sur. 182, A-69. IPP 30.33 BOPD, top pay 1,295.5 ft. sand, 37°. TD 1,298 ft.

Miami Operating Co. 1 Farmer, J. C. Whittenberg Sur. A-1116. Dry. TD 5,335 ft.

Miami Operating Co. 1 Henry L. Wolfe et al, Sec. 3, Blk. 4, Clark & Plumb Subd. Dry. TD 5,804 ft.

Harry F. Snebold et al 1 Petrex Oil Corp., Blk. 45, ATNCL Sur. Dry. TD 4,715 ft.

Baylor County: Felco Oil Co. 1-E C. Cowan, Blk. 113, T&NO Sur. Dry. TD 4,950 ft.

Clay County: L. T. and Bobby Burns 1 R. F. Wynn estate, A. Brinkley Sur. A-23. Dry. TD 6,760 ft.

Grayson County: A. C. Phillips 2 Tidwell, Asa Hartsfield Sur. A-491. IPP 80 BOPD, top pay (Penn.) 4,462 ft., 34°. TD 5,710 ft.

Sun Oil Co. 1 George R. Ferrill, E. C. Smithson Sur. Dry. TD 7,324 ft.

Jack County: M. E. Andrews III, Ltd., and American Drilling Corp. 1 Roy Cherryhomes, Thomas Henry Sur. A-264. Dry. TD 5,860 ft.

Sam Boren 1 Lupton-Brown, G. D. Spottswood Sur. A-522, IP 15,000 M.c.f. of gas per day, conglomerate top pay 5,385 ft. TD 5,402 ft. (Gas discovery.)

Fain & McGaha 1-B Prideaux, W. S. Powell Sur. A-1302. Dry. TD 5,131 ft.

Fain & McGaha 1 Annie Winstead estate, T. C. Snailin Sur. A-517. Dry. TD 3,410 ft.

Luke Grace Drilling Co. 1 Ethel Worthington, J. W. Buckner Sur. A-33. Dry. TD 5,545 ft.

Knox County: A. G. Hill & Roark, Hooker & Roark 1 Alexander Trust estate, GC&SF Sur. A-388. Dry. TD 6,295 ft.

Montague County: Oscar Seltzer 1 Wright Embry, J. D. Pedigo Sur. A-1256. Dry. TD 4,510 ft.

Youngblood & Foree 1 McCall, J. Olibarri Sur. A-579. Dry. TD 6,411 ft.

Wichita County: A. R. Dillard 1 J. Newton Huff, C. Roberts Sur. A-540. Dry. TD 4,122 ft.

Southern Petroleum Exploration, Inc. and Chas. E. Morrison 1 Krohn, Inc., H&GN Sur. A-452. Dry. TD 3,996 ft.

Wilbarger County: Paul Bilbrey and Wayne Albritton 1-A W. T. Waggoner, Sec. 33, Blk. 4, H&TC Sur. Dry. TD 2,510 ft.

Young County: R. W. Darden et al 1 A. Furr, TE&L Sur. Dry. TD 1,059 ft.

Darden & Self 1 Bob Self, Blk. 75, TE&L Sur. Dry. TD 1,105 ft.

Delmac Oil Co. 1 Vaughn, Blk. 3, T&NO Sur. A-248. Dry. TD 2,590 ft.

J. Earle Gray et al 1 Logan, TE&L Sur. 2448. Dry. TD 1,315 ft.

Hannis & Richmond 1 W. S. Davis, Blk. 66, TE&L Sur. Dry. TD 1,090 ft.

Timberlake & Kelleher 1 Prideaux Bros., A. McMullen Sur. A-198. Dry. TD 815 ft.

WEST TEXAS

Andrews County: Anderson-Prichard Oil Corp. 1-H University, 37-5-University Lands. IP 227 BOPD, 36/64-in., 44°, Devonian pay 12,419 ft. TD 12,518 ft.

HONAN-CRANE OIL PURIFIERS

*the choice of Leading Oil Companies**

Honan-Crane Purifiers service 7 880-H.P. gas booster engines at Continental Oil's Sussex plant in Johnson County, Wyo.

The petroleum industry recognizes, better than any other, the importance of clean oil as a factor in equipment maintenance. It is significant, therefore, that leaders in this field choose Honan-Crane Oil Purifiers to protect their own equipment against faulty lubrication and costly damage. Honan-Crane's on-the-job performance on every type of engine—turbine, diesel, gas, gasoline—has proven to these companies that the *best* saves them *most* in the long run.

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Continental Oil Company
Gulf Refining Company
Magnolia Pipe Line Company
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The Pure Oil Company
Sinclair Refining Company
Socony-Vacuum Oil Company
Standard Oil Co. of Ohio
Texas Pipe Line Company
The Texas Company

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...Improve Pumping Engine Operation

Your ignition failure worries are over when your pumping engines are equipped with Fairbanks-Morse Super Spark Magnetos. They are built for rugged, continuous oil field service—heavy-duty high tension coils—large long lasting breaker points and a ball bearing supported one piece magnetic rotor are only a few of the features that make Super Spark Magnetos the favorite.

Super Spark Magnetos keep going under the toughest operating conditions—operate efficiently and economically—rarely need attention or maintenance—costly shut-downs are held to a minimum.

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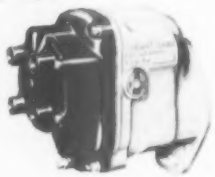

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TULSA, OKLAHOMA

SPINNING LINE CATHEADS • BREAKOUT CATHEADS • AIR OPERATED POWER SLIPS
TUBING TONGS • SAFETY "C" POLISHED ROD CLAMPS

WILDCAT COMPLETIONS

Garrett M. Smith 1-X McWhorter, 8-A29-PSL. IP 1,000 M.f.g., plus ½ bbl. distillate, pay 4,297 ft. TD 4,323 ft.

Borden County: Ryan & Burke 1 Cannon, 22-33-T5N-T&P. Dry. TD 8,390 ft. Elev. 2,640 ft., reef 8,335 ft.

Coke County: Sun Oil Co. 1 Clara E. Walker, 256-1A-H&TC. Dry. TD 6,800 ft.

Howard County: A. K. Turner, Jr. et al 1 C. L. Jones, 34-26-H&TC. Dry. TD 3,070 ft.

Lynn County: Suniland Oil Corp. 1 Bruster, Sec. 1274, J. R. Boules Sur. IPP 61 BOPD, 38°, pay 3,763 ft. TD 3,786 ft.

Menard County: F. H. Carpenter 1 Royal, AB&M Sur. 23. Dry. TD 700 ft.

Price-Kelly Oil Co. 1 Eckert, Isador Muller Sur. 96. Dry. TD 529 ft., completed as fresh water well.

Turley & Bentley 1 Raymond Andrews, Sec. 5, BS&F Sur. Dry. TD 2,504 ft., Ellenburger 2,390 ft.

Mitchell County: Ray A. Albaugh 1 Whittington, 11-17-SPRR. IPP 119 BOPD, 40°, pay 6,520 ft. TD 8,542 ft.

Motley County: Humble Oil & Refining Co. 1-K Matador, Sec. 22, T. G. McNutt Sur. Dry. TD 10,596 ft.

Pecos County: Phillips Petroleum Co. 1-AB Puckett, 44-101-TCRR. Dry. TD 16,535 ft., elev. 3,325 ft., Ellenburger 14,730 ft., pre-Cambrian 16,502 ft.

Runnels County: American Trading & Production Corp. 1 McShan, R. M. Williamson Sur. 233. Dry. TD 4,584 ft., elev. 1,709 ft., Ellenburger 4,084 ft., Cambrian 4,534 ft.

Schleicher County: Delta Gulf and W. H. Hunt 1 R. L. Henderson, Sec. 1209, TCRR Sur. Dry. TD 7,350 ft., elev. 2,396 ft., Strawn 7,035 ft., Ellenburger 7,212 ft.

Sterling County: Harry Hubbard 1 Clark, 9-A-TCRR. Dry. TD 1,602 ft.

Sutton County: British American Oil Producing Co. 1 Sam H. Allison, 7-B-HE&WT. Dry. TD 5,202 ft., elev. 2,310 ft., Strawn 5,152 ft.

Upton County: Garlitz-Howell & Inman 1 Curtis Inman-Shirk, 37-1-MK&T. Dry. TD 2,424 ft.

SOUTHEAST NEW MEXICO

Lea County: W. H. Black 1 American Republics, 14-20s-33e. IPP 147 BO in 20 hours, 33°, Seven Rivers pay 3,373 ft. TD 3,385 ft.

Rowan Oil Co. 1 N. B. Dunnin, 18-21s-38e. Dry. TD 9,966 ft., elev. 3,491 ft., Siluro-Devonian 7,820 ft., Devonian 8,413 ft., Ellenburger 9,825 ft.

NORTHERN NEW MEXICO

Sandoval County: El Paso Natural Gas 1 Elliott-State, SW SE NW 36-19n-2w. Dry. TD 8,254 ft. Quartzite 8,237 ft.

ILLINOIS

Clinton County: R. H. Robben 1 Haake, NW SE NW 32-2n-3w. Dry. TD 2,592 ft.

Jasper County: Calvert Drilling Co. 1 Blank, SW SW NE 29-6n-10e. Dry. TD 2,888 ft.

Twin City Development Co. 1 Probst, SE SE SE 27-8n-8e. Dry. TD 2,985 ft.

Macoupin County: H. E. Livermore 1 Kissel, SW SW NE 35-7n-7w. Dry. TD 500 ft.

Madison County: George Cassens 1 Fee, NW NE SE 14-5n-7w. Dry. TD 1,721 ft.

Washington County: F. L. Dittmeier 1 Oberhofer, NE NW NW 5-3s-1w. Dry. TD 1,487 ft.

Dale Hopkins 1 Poggenmoeller, NE SE NE 4-1s-1w. Dry. TD 1,515 ft.

INDIANA

Clay County: T& H Corp. 1 Whittington, NE NE SE 13-12n-7w. Dry. TD 1,440 ft.

Dubois County: Steckler & Rea 1 A. Hurst, SE NW SW 2-3s-5w. Dry. TD 1,374 ft.

Basin Drilling Co. 1 Woebkenberg, NE SE SW 29-3s-4w. Dry. TD 875 ft.

Olds Oil Co. 1 Blessinger, SE SE NW 15-2s-5w. Dry. TD 925 ft.

Gibson County: Slagter Production Co. 1 Urban Simon, SW SE SW 29-3s-11w. Dry. TD 2,630 ft.

Knox County: R. Brinkley 1 Musgrave-Lindley, NW SE NE 8-5n-10w. Dry. TD 870 ft.

J. F. Gatewood 1 Bobe, SE SE NW 23-5n-8w. Dry. TD 1,300 ft.

Pike County: C. S. Higgins 1 Richardson, NW SW NE 10-1s-8w. Dry. TD 1,505 ft.

J. L. Higgins 1 Lemons-Higgins, SW SW SW 22-1n-8w. Dry. TD 1,476 ft.

Posey County: Fred Graham 1 Ritzert, NE NE NW 32-6s-12w. Dry. TD 1,236 ft.

Vigo County: Great Lakes Carbon Co. 1 Hickey-Sanders, NW NW SE 24-10n-11w. Dry. TD 1,416 ft.

KENTUCKY

Daviess County: G. A. Hoffman 1 Foster, NE SE NE 4-P-27. Dry. TD 1,332 ft.

Hopkins County: Hupp & Hume 1 Rudd, SW SE NE 24-L-26. Dry. TD 2,873 ft.

I. B. Browning 1 King, SW NE NE 14-I-24. Dry. TD 3,270 ft.

McLean County: R. E. Stouder 1 McRay, NE SE SE 5-L-27. Dry. TD 2,720 ft.

MICHIGAN

Allegan County: Sheldon-Stewart Co. 1 Travest-Weaver, SE SE SW 15-2n-13w. Dry. TD 1,433 ft. in Traverse lime.

Ottawa County: J. Paul Herman 1 Snowdin, SE NW SW 6-9n-13w. Dry. TD 2,036 ft. in Traverse lime.

Ottawa County: Cook Drilling Co. 1 Hecksel, NE NE SW 9-8n-14w. Dry. TD 1,929 ft. in Traverse lime.

Muskegon County: Clifford A. Perry 1 Seba, NE SW NE 36-9n-15w. Dry. TD 1,862 ft. in Traverse lime.

Van Buren County: Ford Oil Co. 1 Kpusta, NE NE NE 36-3s-14w. Dry. TD 1,076 ft. in Traverse lime.

WEST VIRGINIA

Clay County, Union district: United Fuel Gas Co. 8000 Fee, elevation 1,227 ft. Dry. Oriskany sand 5,737-5,795 ft., Newberry 6,635-6,675 ft., Keefer 6,930-6,980 ft., Clinton sand 7,415-7,489 ft., gas and water 7,466-7,472 ft., TD 8,144 ft.

ALABAMA

Escambia County: Gulf Refining Co. 7 Miller, 9-2n-11e. Dry. TD 5,700 ft. Elev. 242 ft., Wilcox 1,170 ft., Chalk 2,831 ft., Eagle Ford 4,230 ft., marine Tuscaloosa 4,980 ft., Massive 5,383 ft., lower Cretaceous 5,638 ft.

MISSISSIPPI

Adams County: John S. Callon 1 Foster, 35-8n-1w. IPP 76 BOPD, 40.5°, Wilcox 5,702-06 ft. (casing perforations). TD 6,515 ft. Elev. 298 ft., Sparta 2,701 ft., Wilcox 4,995 ft., Artman zone 5,631 ft. (New field.)

Lindsey-Biglane-Callon 1 Armstrong, 35-8n-1w. IPP 60 BOPD, 35°, Wilcox 4,250-60 ft. (casing perforations.) TD 6,505 ft. Elev. 304 ft., Sparta 2,684 ft., Wilcox 3,996 ft., Artman zone 5,642 ft. (New field.)

Lindsey-Biglane-Callon 1-A Armstrong, 34-5n-3w. Dry. TD 7,003 ft. Elev. 139 ft., Wilcox 4,732 ft., base Baker shale 6,506 ft.

Vaughey & Vaughey 1 Armstrong, 24-5n-2w. Dry. TD 6,802 ft. Elev. 97 ft., Wilcox 4,618 ft., base Baker shale 6,433 ft., Harmon zone 6,599 ft., Minter zone 6,743 ft.

Jefferson County: Humble Oil & Refining Co. 1 Phillips et al, 6-10n-2w. IP 14 BCPD with 445 M.c.f. daily, ¼-in., lower Tuscaloosa 9,160-72 ft. (casing perforations). TD 9,524 ft. Elev. 75 ft., Wilcox 3,371 ft., Tuscaloosa 8,458 ft., marine Tuscaloosa 8,860 ft., Massive Tuscaloosa 9,160 ft. (New field.)

Lee County: K. A. Ellison 1 Neely, C NE SW 28-11s-5e. Dry. TD 4,240 ft. Elev. 315 ft., Mississippian 1,245 ft., Devonian 2,662 ft., Silurian 3,166 ft., Ordovician 3,400 ft., Knox 3,840 ft.

Pike County: Sun Oil Co. 1 Guy et al, 18-4n-9e. Dry. TD 6,506 ft.

WILDCAT COMPLETIONS

Union County: Richardson Oils, Inc., and Black & Nichols 1 Robbins, C SE SW 3-8s-1e. Dry. TD 3,477 ft.

Wilkinson County: Gulf Refining Co. 36 Crosby, 32-4n-2w. Dry. TD 7,509 ft. Elev. 330 ft., Wilcox 5,193 ft ft., base Baker shale 6,957 ft.

SOUTH LOUISIANA

Jefferson Davis Parish: Vincent & Welsh et al 1 Jennings, 11-7s-3w. Dry. TD 8,780 ft.

Lafourche Parish: Bateman Drilling Co. and Sun Oil Co. 1 Allan, 62-16s-19e. Dry. TD 12,541 ft.

Seaboard Oil Co. of Delaware 1 State Lease 2343, 29-20s-24e. Dry. TD 12,510 ft.

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WILDCAT COMPLETIONS

St. Martin Parish: Warren Petroleum Corp. 1 Voorhies, 72-9s-5e. IP 493 BOPD, 12/64-in., 34.6°, casing perforations 8,676-81 ft. TD 9,616 ft. (Extends Anse La Butte field.)

St. Mary Parish: Magnolia Petroleum Co. 1-F State Lease 691, Blk 119, Eugene Island area. IP 557.96 BOPD, 12/64-in., 36.1°, casing perforations 9,476-86 ft. TD 10,196 ft. (New pay in Eugene Island Blk. 126 field.)

Forrest Oil Corp. 1 State Lease 2195. Dry. TD 11,760 ft.

Orleans Parish: The Texas Co. 1 State Lease 1901, Pointe Aux Marchettes, Township 12s-16e, in Lake Borgne. Dry. TD 11,466

NORTH LOUISIANA

Concordia Parish: H. L. Hunt and Gulf Refining Co. 22 Fisher Lumber Co. "E," C NW SE 13-6n-8e. Dry. TD 6,730 ft.

Wentworth, Justiss-Mears Oil Co. 1 Angelina Hardwood Lumber Co., 660 ft. N and W SEc 40-3n-7e. Dry. TD 7,619 ft.

Union Parish: Phillips Petroleum Co. 1 Hamilton, 125 ft. NW of C NE SW SW 22-19n-1e. Dry. TD 9,203 ft.

ARKANSAS

Columbia County: McAlester Fuel Co. 1 Hollensworth "B," 200 ft. SW of C SW 31-17s-18w. IPP 110 BOPD, Pettit 4,261-66, 4,268-70 ft. 32°. TD 7,816 ft. (New pay in Spotville.)

Union County: Stanolind Oil & Gas Co. 1 Olin Industries, C SE NW SE 18-17s-11w. Dry. TD 4,305 ft.

OKLAHOMA

Carter County: Woodward and Co. 1 Barker, NW NW NW 33-4s-3w. IPF 33 BOPD, Hunton 6,410-7,154 ft., 3/8-in., 38°. TD 7,172 ft. (oil discovery).

Cleveland County: Continental Oil Co. 1 Cook, Jr., SW SE NE 15-8n-1w. IPF 120 BOPD, Wilcox 7,181-82 ft., 37.7°, 17/64-in. TD 8,009 ft. (oil discovery).

Cotton County: Paul C. Teas 1 Norman, SE SE NW 19-2s-9w. Dry. TD 3,552 ft.

Grant County: Walter Duncan 1 Durland, SE SE NE 5-27n-3w. Dry. TD 5,300 ft.

Jefferson County: R. B. Farris et al 1 Harris, SW SW SW 8-6s-5w. Dry. TD 3,120 ft.

Lincoln County: D&L Oil Co. and Murphy Oil Co. 1 Denyar, SE SE NW 33-15n-4e. Dry. TD 4,975 ft.

Noble County: Powel, Stratford & Hayward 1 Heister, NW SW SW 19-22n-2w. Dry. TD 2,300 ft.

Okfuskee County: Plateau Development Co. 1 Replogle, NW SW SW 10-13n-9e. IPP 7-8 BOPD, Dutcher, 3,167-95 ft., 32°. TD 3,992 ft. (Oil discovery.)

Pontotoc County: Star Enterprises 1 Burkhart, NW SW NE 30-3n-4e. Dry. TD 2,701 ft.

Bill Erdwurm 1 Phillips, SW NW NW 36-4n-4e. Dry. TD 2,915 ft.

Pottawatomie County: Sam A. King 1 School land, SW NW NE 16-7n-2e. Dry. TD 5,947 ft.

T. T. Eason & Co. 1 Longacre, NE SE NW 36-11n-2e. Dry. TD 5,938 ft.

Seminole County: Cal-Ok Oil Co. 1 Whitlock, NE SE SW 36-7n-7e. Dry. TD 3,705 ft.

Tillman County: Beach & Talbot 1 McGuire, NE NE NE 4-2s-19w. Dry. TD 5,554 ft.

KANSAS

Barton County: T. Palmer-Ashmar Drilling Co. 1 Murphy, SW SW NE 23-20s-13w. Dry. TD 3,517 ft.

Butler County: Rex & Morris 1 Ferking, SE NE SE 4-24s-5e. Dry. TD 2,531 ft.

Murfin Drilling Co. 1 Rogers, SE SE SW 35-26s-6e. Dry. TD 3,266 ft.

Cowley County: Wakefield 1 Turley, SE NE SW 5-31s-3e. Dry. TD 3,189 ft.

Laura Jane Oil Co. et al 1 Bonewell, NE NW NW 25-31s-3e. Dry. TD 3,025 ft.

Laura Jane 3 Bolack, NE SE SW 16-32s-6e. Dry. TD 2,950 ft.

Wakefield 1 Casement, NE NW SE 11-35s-4e. Dry. TD 3,295 ft.

Ellis County: Virginia Drilling Co. 1 Rathburn B, NW NW NW 19-11s-19w. Dry. TD 3,618 ft.

Murfin 1 Leiker, NW NW SW 25-14s-18w. Dry. TD 3,635 ft.

Greenwood County: Akin & Owen 1 Henson, SW NE NE 6-26s-9e. Dry. TD 2,375 ft.

Russell County: Midstates et al 1 Eulert, SE SE NE 4-12s-15w. Dry. TD 3,245 ft.

Sam Kessler et al 1 McCune, NW NW NE 32-12s-15w. Dry. TD 3,410 ft.

Saline County: Carey 1 Lagerstrom, SW SW NE 33-16s-4w. Dry. TD 3,834 ft.

Stanton County: Superior 1 Wade, SW SW NE 30-29s-41w. Dry. TD 6,434 ft. Arbuckle 6,361 ft.

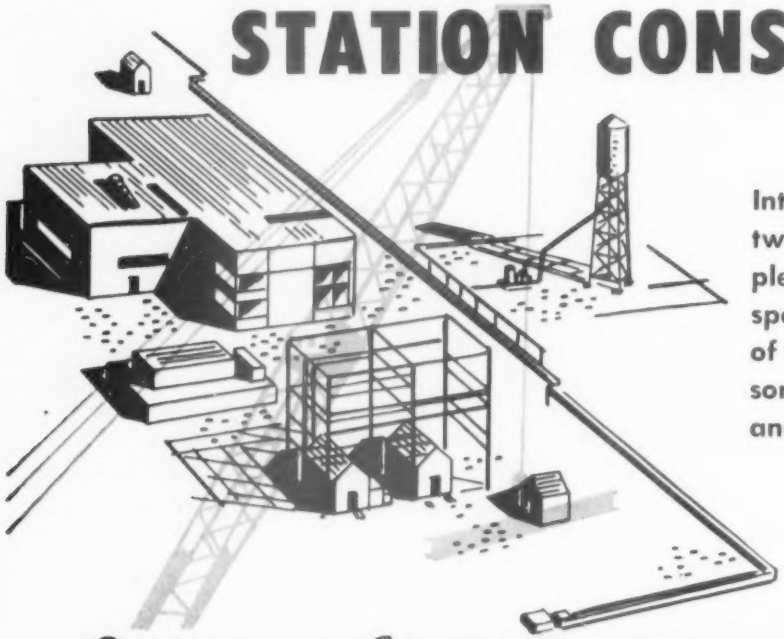
NEBRASKA

Cheyenne County, Runge: The Chicago Corp. and Republic Natural Gas Co. 1 Runge, SW SE NE 17-14n-50w. IPP 65 BOPD, and 27 BWPD, "D" sand discovery—new field. "J" sand 4,865 ft. TD 4,927 ft.

NORTH DAKOTA

Bottineau County: Zach Brooks 1 Haugen, NW NE 11-163n-80w. Dry. TD 3,755 ft. Lodgepole 3,684 ft.

STATION CONSTRUCTION



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Ramsey County: McLaughlin, Inc. et al 1 Wolfe-Federal Land Bank, NE SW 33-158n-62w. Dry. TD 3,195 ft. Pre-Cambrian 3,195 ft.

CALIFORNIA

Fresno County: L. A. Harnish, Opr. 73-32F "Well," SW NE 32-20s-16e, IPF 906 BOPD through 24/64-in. choke, 36.5° gravity, 8,351-8,410 ft. in Leda sand of lower Miocene, TD 8,410 ft. (New field discovery 1 mile south of Pleasant Valley field.)

Kern County: Bradford Bishop 11A-1 Glide, 11-27s-28e. Dry. TD Vedder 1,030 ft., TD 1,065 ft.

Fischgrund & Shane 1 Drury, 8-30s-28e. Dry. Pyramid Hills 5,986 ft., TD 6,200 ft.

Richfield Oil Corp. 78-31 Goyner-U.S.L., 31-32s-23e. Dry. TD 11,438 ft.

Richfield Oil Corp. 2 San Emidio, 6-10n-21w. Dry. TD 9,030 ft.

Richfield Oil Corp. 81-16 Tejon-D, 16-11n-18w. Dry. TD 1,569 ft.

Shell Oil Co. 58-5 "Well," 5-26s-19e. Dry. TD 4,299 ft.

Standard Oil Co. of California 47-8 Jeppi-Camp, SE SW 8-30s-29e, IPF 82 BOPD, 10/64-in. bean, 37.7° gravity, perfs. 5,915-50 ft. in Pyramid Hills sand (Miocene), TD 6,115 ft. (About ½ mile extension to Jeppi pool of Race Track Hill field.)

Superior Oil Co. 1 Derby, 15-31s-29e. Dry. TD 7,109 ft.

T & T Oil Co. 55 Neumarkel, 28-30s-30e. Dry. TD 1,001 ft.

Sacramento County: M. E. & Frank Silva Co. 1 Silva, SW NW 24-4n-3e, IPF 4,000 M.c.f. gas, 20/64-in. choke, perfs. 3,779-3,831 ft. in Nortonville sand (Eocene), TD 4,650 ft. (New fault block pool in Rio Vista field.)

Santa Barbara County: Intex Oil Co. 1 Gobernador, 26-4n-25w. Dry. TD 3,310 ft.

Sonoma County: Tide Water Assoc. Oil Co. 1 Noble, 29-4n-5w. Dry. TD 7,167 ft.

Ventura County: Union Oil Co. 1 Union-Continental-Janss, 22-2n-21w. Dry. TD 10,170 ft.

Yolo County: Signal Oil & Gas Co. 1 Signal-Monterey-Reclamation,, SE NW 20-12n-1e, IPF 4,100 M.c.f. gas, 17/64-in. choke, perfs. 3,717-24 ft. in lower Eocene sand, top Cretaceous 4,008 ft., TD 5,500 ft. (New field discovery 7 miles northeast of Dunnigan Hills gas field.)

MONTANA

Golden Valley County, Dead-man's basin: The Chicago Corp.-Republic Natural Gas Co. 1 Government-Kinahan, NW NE NE 18-7n-19e. Dry. TD 4,700 ft. Mission Canyon 4,436 ft.

McCone County, Golden Gulch: Shell Oil Co. 11-21e NP, C NW NW 21-23n-49e. Dry. TD 9,810 ft. Ordovician 9,534 ft.

Teton County, Dutton area: P. J. McDonough 1 Jones, NE NE SE 14-27n-5w. Dry. TD 2,261 ft., Madison 2,258 ft.

WYOMING

Niobrara County, Snyder Creek: Pubco Development Co. 1 Government, NE NE NE 18-40n-64w. Dry. TD 6,709 ft. Lakota 6,662 ft.

Washakie County, Winchester: Sinclair Oil & Gas 1 Winchester Unit, NE NE SW 29-45n-93w. Dry. TD 11,972 ft. Tensleep 11,814 ft.

UTAH

Uintah County, Walker Hollow: Carter Oil Co. 1 Bamberger Unit, C SW NE 11-7s-23e. IP swabbed 109 BO, 5 BW and 16 bbl. BS in 24 hours. Wasatch 5,731 ft. TD 5,754 ft. PB 5,288 ft.

WILDCAT COMPLETIONS

COLORADO

Adams County: Petroleum, Inc. 1 Kolettis, SE SE SE 11-1s-58w. Dry. TD 5,948 ft. "J" sand 5,854 ft.

Ginther, Warren & Ginther 1 UPRR-Flader, NE NE SE 19-2s-58w. Dry. TD 6,333 ft. "J" sand 6,109 ft.

Marmack & Crawford-Bay Petroleum 1 W. F. Jolly, CN½ NE NW 34-3s-58w. Dry. TD 5,808 ft. "J" sand 5,616 ft.

Huerfano County: K. D. Drilling Co. 1 Suliba, NE SE NE 23-28s-65w. Dry. 550 TD.

La Plata County: Great Western Drilling 1 Fort Lewis School Land, CN½ NE NE 3-34n-11w. Dry. TD 10,214 ft. Elbert 10,177 ft.

Logan County: Ryan Oil 1-"B" State, NW NW NW 16-7n-55w. Dry. TD 5,630 ft. Skull Creek 5,628 ft.

Balderson Denver Drilling Co. 1 Haley-Smith, SE SE NE 29-11n-53w. Dry. TD 5,247 ft. "J" sand 5,141 ft.

Washington County: Eastern States Petroleum 1 D. W. Jackson, SW NW SE 23-3n-52w. Dry. TD 4,790 ft. "J" sand 4,636 ft.

SASKATCHEWAN

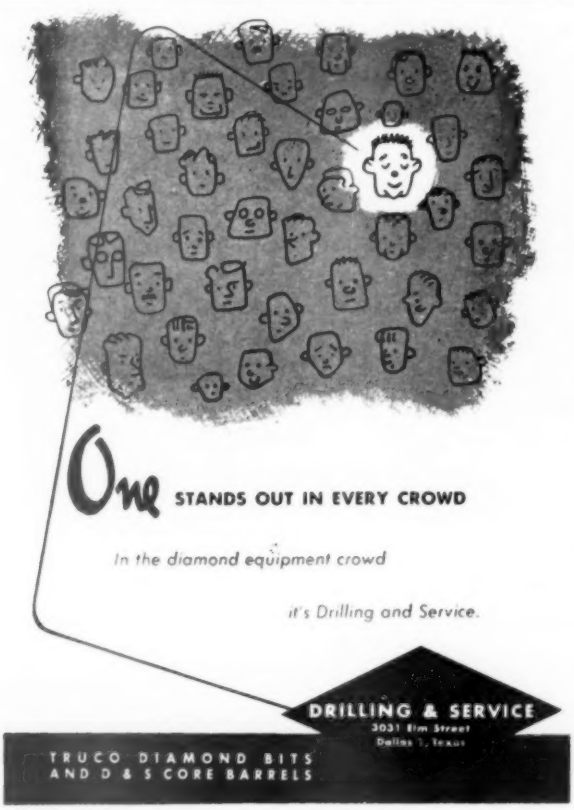
Socony-Sohio 1 Buttress, LSD 8, 4-15-28w2. Dry. TD 6,678 ft.

Palmer 1 Moose Mountain, LSD 6, 18-10-6w2. Dry. TD 4,400 ft.

Tide Water-Markinch 1 Crown, LSD 13, 29-23-17w2. Dry. TD 2,843 ft.

Tide Water-Rush Lake 5 Crown, LSD 4, 34-18-11w3. Dry. TD 3,746 ft.

(Continued on page 221)



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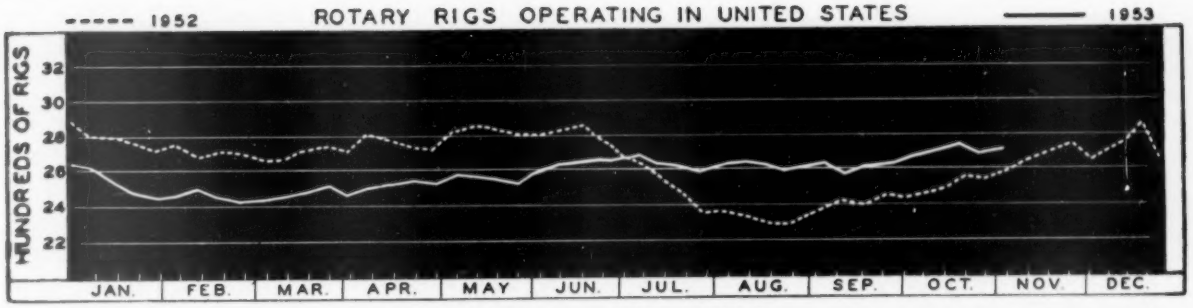
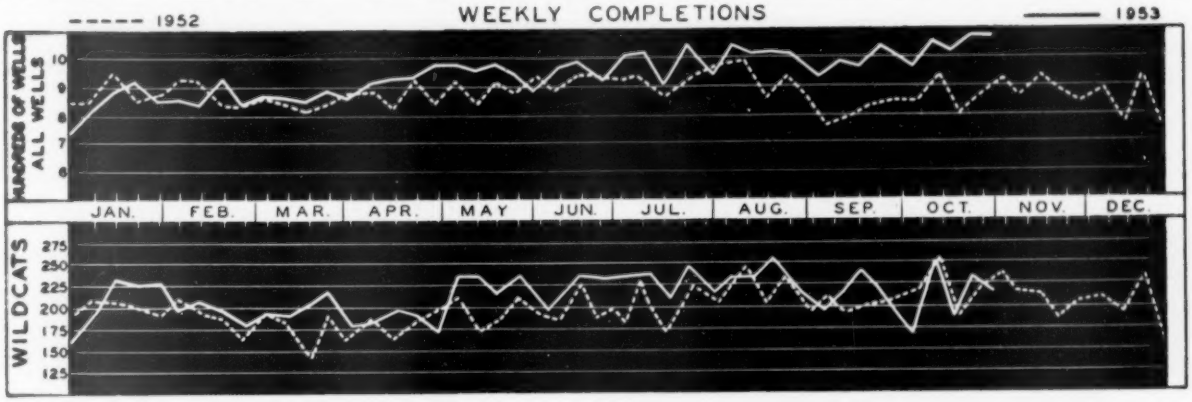




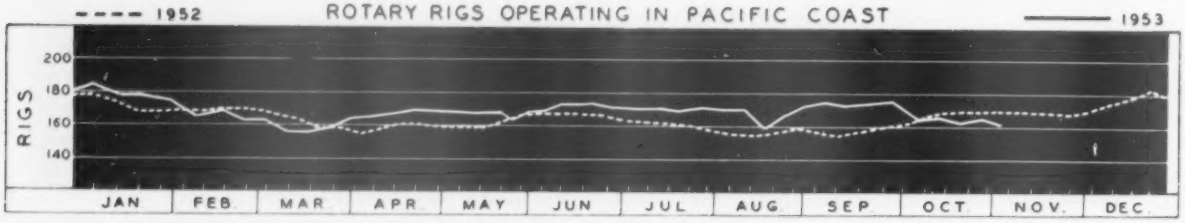
CURRENT STATISTICS

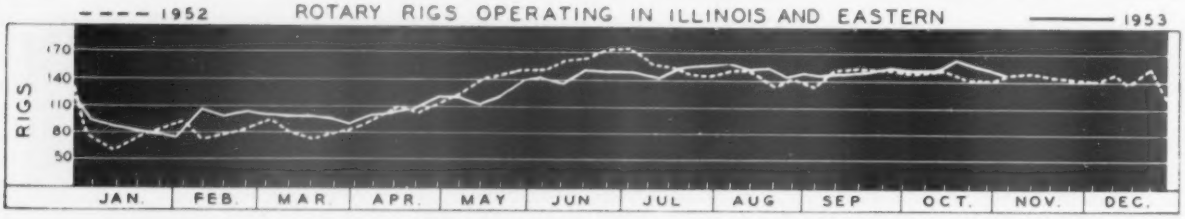
EXPLORATION

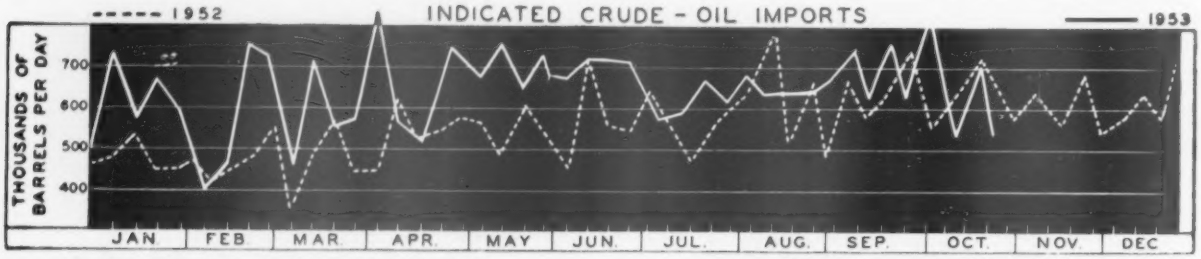
WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 31, 1953

	Total of all wells							Wildcat completions and discoveries									
						Oct. 31							Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	16	8	0	*8	23,500	635	650	0	0	0	0	0	0	0	0	0	0
Pennsylvania	40	21	2	†17	67,750	1,589	1,594	0	0	0	0	0	0	0	3	12	15
West Virginia	23	2	17	4	63,883	526	497	0	0	0	1	1	0	0	10	6	16
Ohio	12	3	4	5	20,893	879	879	0	0	0	0	0	2	0	3	13	18
Indiana	37	10	1	26	51,348	1,086	1,061	0	0	0	11	11	12	0	2	299	313
Kentucky	25	8	8	9	47,985	948	1,089	0	0	0	4	4	8	0	1	161	170
Illinois	51	26	0	25	127,822	1,690	1,778	0	0	0	7	7	5	0	0	347	352
Michigan	13	5	0	8	34,557	512	593	0	0	0	5	5	15	0	5	215	235
Kansas	80	41	2	‡37	272,119	4,055	3,802	0	0	0	14	14	78	0	31	638	747
Nebraska	2	2	0	0	10,862	268	243	1	0	0	0	1	16	0	5	111	132
Oklahoma	190	127	4	§59	625,703	6,258	4,799	3	0	0	11	14	102	6	28	514	650
Texas	361	203	17	141	1,654,125	14,273	14,585	11	1	2	90	104	724	52	149	3,511	4,436
North Central (Dist. 7-B & 9)	165	96	0	69	588,934	5,409	4,731	3	0	0	41	44	376	0	16	1,405	1,797
West (Dist. 7-C & 8)	70	47	1	22	353,214	3,089	4,388	3	0	1	13	17	155	2	13	563	733
Panhandle (Dist. 10)	10	9	0	1	34,026	640	549	0	0	0	0	0	0	2	0	16	18
Eastern (Dist. 5 & 6)	10	4	3	3	66,811	672	680	1	0	0	2	3	20	2	5	222	249
Gulf Coast (Dist. 2 & 3)	56	20	6	30	358,407	2,087	2,195	2	1	1	20	24	89	21	62	566	738
Southwest (Dist. 1 & 4)	50	27	7	16	252,733	2,376	2,042	2	0	0	14	16	84	25	53	739	901
Louisiana	71	52	1	18	454,675	2,268	1,947	2	0	0	8	10	68	30	19	310	427
Northern	35	27	1	7	101,983	980	1,056	0	0	0	3	3	9	2	2	127	140
Southern	36	25	0	11	352,692	1,288	891	2	0	0	5	7	59	28	17	183	287
Arkansas	14	6	0	8	57,435	456	337	1	0	0	1	2	12	0	0	108	120
Mississippi	14	7	0	7	97,934	322	292	3	0	0	6	9	17	1	4	142	164
Southeastern States	1	0	0	1	5,700	122	64	0	0	0	1	1	1	0	0	99	100
Montana	6	3	0	3	37,825	349	267	0	0	0	3	3	12	0	0	88	100
Wyoming	18	16	0	2	98,610	670	552	0	0	0	2	2	22	0	3	115	140
Colorado	13	1	0	12	70,098	580	380	0	0	0	8	8	24	0	11	256	291
Utah	2	2	0	0	11,450	59	61	1	0	0	0	1	3	0	4	31	38
New Mexico	18	7	7	4	92,073	1,175	860	1	0	0	2	3	20	1	14	106	141
California	59	42	2	15	296,440	2,134	2,023	2	0	2	11	15	56	0	11	474	541
North Dakota	9	6	0	3	65,765	220	87	0	0	0	2	2	9	0	0	57	66
Miscellaneous	0	0	0	0	0	69	121	0	0	0	0	0	1	0	4	41	46
Total United States	1,075	598	65	412	4,288,552	41,143	38,561	25	1	4	187	217	1,207	90	307	7,654	9,258
Total previous week	1,078	572	84	422	4,326,829			19	2	9	202	232	1,182	89	303	7,467	9,041
Total November 1, 1952	913	409	73	431	3,493,910			18	1	7	208	234	1,165	69	212	7,256	8,702

Service wells included: *8, †15, ‡2, §5.



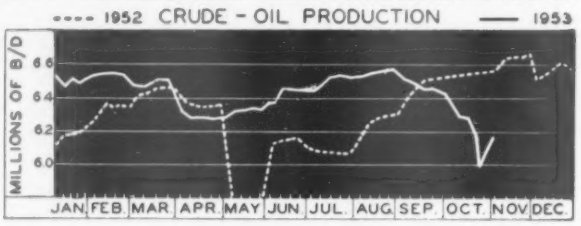


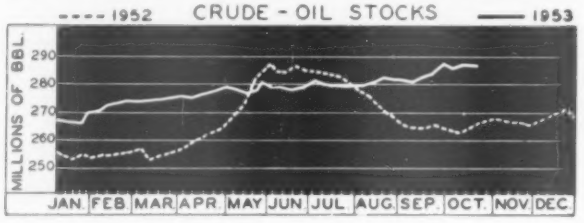


DAILY AVERAGE PRODUCTION FOR WEEK

	October 31 Crude oil	October 31 Lease condensate	October 31 Total	Oct. 24 total
Alabama	4,600		4,600	4,700
Arkansas	75,300	450	75,750	73,400
California	996,700		996,700	997,500
Colorado	105,400		105,400	106,700
Eastern	60,000		60,000	60,000
Florida	1,550		1,550	1,550
Illinois	167,600		167,600	165,200
Indiana	34,700		34,700	35,000
Kansas	230,000		230,000	†45,500
Kentucky	32,500		32,500	32,500
Louisiana	590,350	40,500	630,850	627,700
North	98,500	3,000	101,500	98,350
South	491,850	37,500	529,350	529,350
Michigan	33,200		33,200	32,500
Mississippi	86,100	3,050	89,150	86,300
Montana	31,600		31,600	31,400
Nebraska	12,500		12,500	12,500
New Mexico	203,875	550	204,425	204,425
Oklahoma	509,800		509,800	513,300
Texas	2,692,175	46,200	2,738,375	2,738,375
Dist. 1	38,575	350	38,925	38,925
Dist. 2	145,625	5,100	150,725	150,725
Dist. 3	434,600	24,150	458,750	458,750
Dist. 4	254,375	5,700	260,075	260,075
Dist. 5	47,500	400	47,900	47,900
Dist. 6	122,875	5,000	127,875	127,875
East Texas field	244,500		244,500	244,500
Dist. 7-B	117,950	50	118,000	118,000
Dist. 7-C	163,250	4,150	167,400	167,400
Dist. 8	862,225	900	863,125	863,125
Dist. 9	185,325	350	185,675	185,675
Dist. 10	75,375	50	75,425	75,425
Utah	4,800		4,800	4,400
Wyoming	209,100		209,100	208,700
North Dakota	13,700		13,700	13,600
Total U. S.	6,095,550	90,750	6,186,300	†5,995,250
Change from previous week			up 191,050	
Canada	254,750		254,750	236,825
Total U. S. production January 1-October 31			†1,973,205,625 bbl.	
Same period last year (crude plus cond.)			*1,891,741,000 bbl.	

*Includes 25,737,985 bbl. condensate. †Revised.



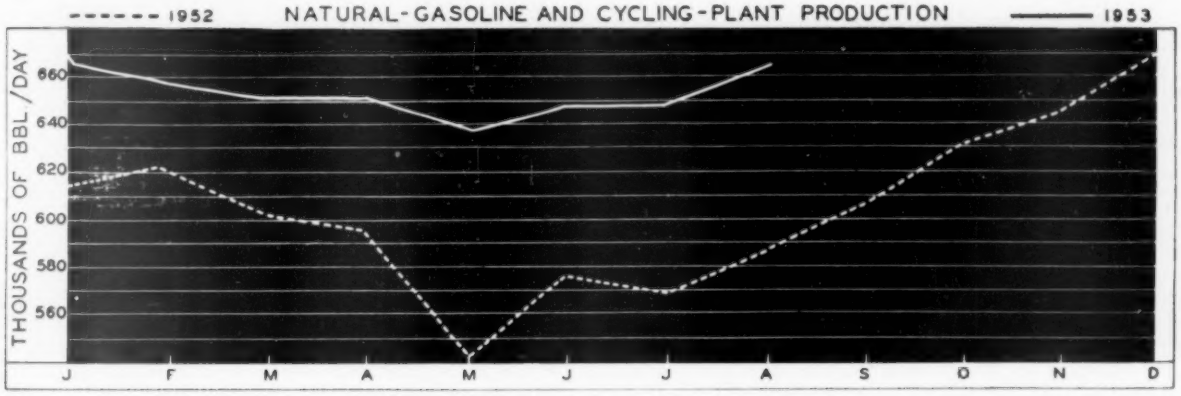


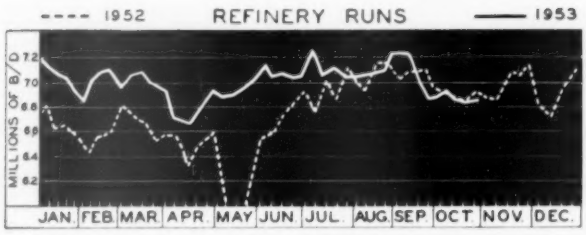
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

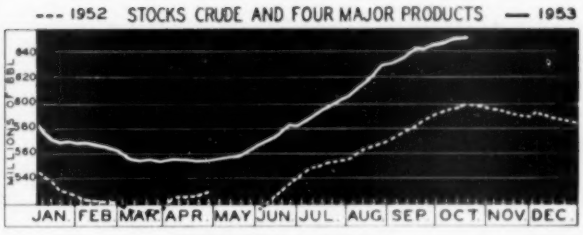
(Thousands of barrels)

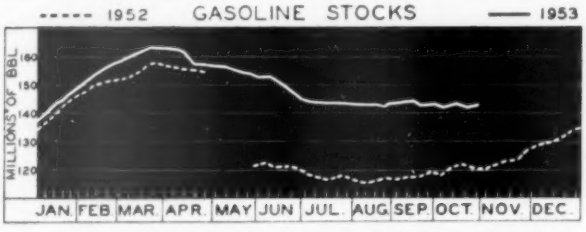
	Oct. 24, '53	Oct. 17, '53	Oct. 25, '52
Pennsylvania Grade	2,944	2,912	2,219
Other Appalachian	2,066	2,078	2,289
Illinois, Indiana, Michigan	12,628	12,058	12,306
Arkansas	3,344	3,486	2,885
Louisiana	17,228	17,244	15,960
North	3,207	2,799	2,497
Gulf	14,021	14,445	13,463
Mississippi	3,598	3,615	3,054
New Mexico	9,271	9,178	7,748
Oklahoma and Kansas	40,962	42,283	38,233
Texas	134,719	134,023	128,175
East Texas	12,152	12,090	12,079
West Texas	60,017	60,480	58,660
Texas Gulf	29,390	28,495	25,683
Other Texas	33,160	32,958	31,753
Rocky Mountain	16,599	16,790	14,707
California	33,112	33,358	31,526
Foreign	†10,446	10,806	8,373
Total	286,917	287,831	267,475

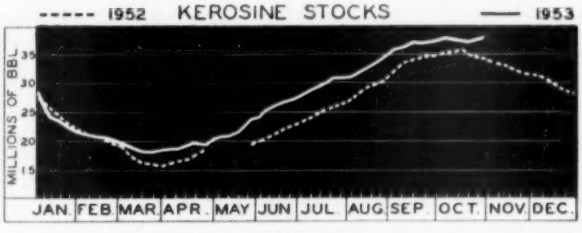
*Bureau of Mines. †Includes 3,207,000 bbl. in California.

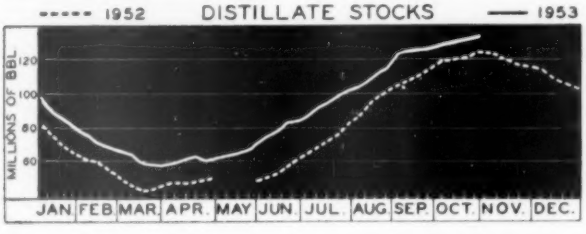


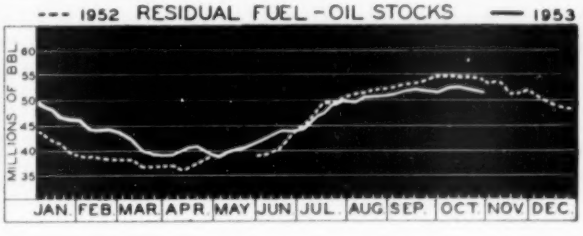










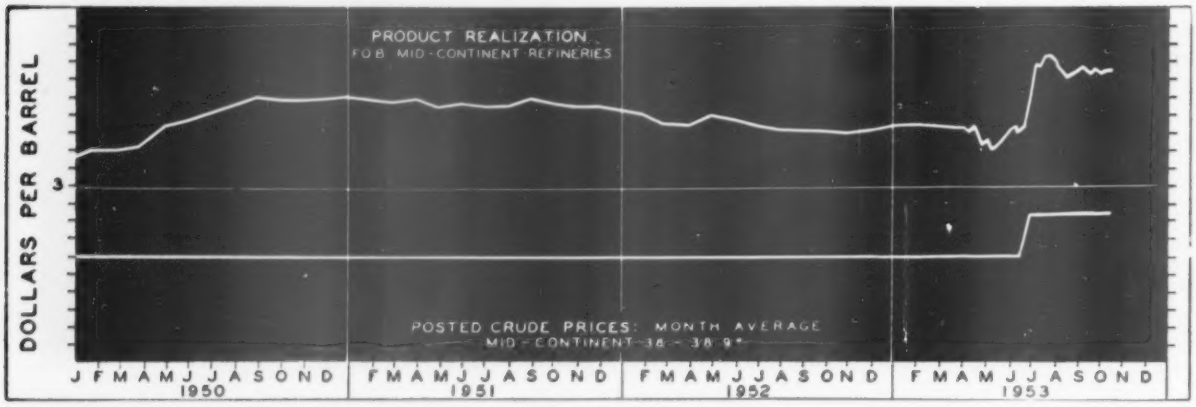


A.P.I. REFINERY REPORT, OCTOBER 31

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1952 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	986	411.4	33.7	247.9	185.1	33,754	15,570	49,596	12,252	1,045	422.7	44.7	254.9	219.6
Appalachian:														
District 1	102	37.3	6.6	17.1	11.7	3,864	631	1,740	815	97	40.8	5.9	17.2	13.9
District 2	91	47.6	4.0	15.6	12.6	1,681	669	731	136	87	40.7	6.7	13.1	13.9
Ind., Ill., Ky.	1,243	684.6	90.3	211.6	172.6	27,170	9,644	24,726	4,655	1,244	674.6	73.6	220.5	159.0
Okla., Kans., Mo.	553	330.8	17.9	122.1	46.4	14,207	2,318	12,922	1,313	565	324.9	11.4	136.6	58.0
Inland Texas	250	182.9	11.7	45.7	31.1	6,055	617	2,537	1,413	265	180.0	12.8	41.4	36.9
Texas Gulf Coast	1,641	798.4	135.3	405.0	232.6	20,401	4,492	16,753	7,006	1,746	780.6	117.5	450.3	268.6
La. Gulf Coast	561	277.6	68.7	123.0	38.4	8,028	2,692	7,305	1,412	525	269.2	61.1	131.0	54.8
N. La. and Ark.	88	38.7	6.1	17.6	6.3	3,253	669	862	148	85	34.4	7.6	21.5	7.0
Rocky Mountain:														
New Mexico	19	12.6		3.0	3.9	164		58	31	18	11.2	0.7	2.9	4.1
Other Rocky Mtn.	217	107.7	2.4	51.6	37.0	4,593	261	2,810	974	205	99.2	5.1	39.4	39.6
California	1,116	458.0	12.0	193.1	363.9	20,198	400	14,591	21,403	1,091	422.5	5.1	173.7	328.5
Oct. 31, 1953	6,867	3,387.6	388.7	1,453.3	1,141.6	143,368	37,963	134,631	51,558	6,883	3,300.8	352.2	1,457.5	1,203.9
Oct. 24, 1953	6,830	3,373.6	325.3	1,414.3	1,166.1	142,666	37,394	132,767	52,633					
Nov. 1, 1952	6,892	3,383.9	369.6	1,415.3	1,217.9	120,563	33,760	120,267	53,292					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.66 for week ended October 24, $3.66 for previous week, and $3.33 for October 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of November 4, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	11.125-11.625	13-13.8	11-11.75
Premium gasoline	12.125-12.625	14.5-14.8	12.25-12.75
42-44 w.w. kerosine	8.875-9.25	10.4-10.9	8.875-9.5
No. 2 straw fuel oil	7.875-8.25	9.4-9.9	8.25-8.5
No. 6 residual	$1.35-1.40	$2.25-2.40	$1.85-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.10	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13.75
750 vis., No. 3-4 neutral	16.75
2,000 No. 5-6 neutral	18-18.75

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	20.5-21.5
200 vis., No. 3 neutral, 0-10 pp.	14.5

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	21.5
180 vis., 10 p.t. neutral	25.5

WAX

Mid-Continent

132-134 A.M.P.	6.0

RESIDUAL fuel is a little harder to find in the Mid-Continent area and is firm in all marketing areas east of California. Most of the Group 3 material on the spot market is selling for $1.35 a barrel for northern shipment. Some contract fuel is moving at $1.30 since contracts were written for the "low," reported in certain price publications, and these published quotations have been held at $1.30 since there has been very little residual fuel available for spot shipment. Reports indicate that buyers are willing to pay prices up to $1.35 but that most of the current supply is moving against contract.

Also, in a very strong market, suppliers are in no big rush to offer on the open market the small volumes produced in excess of contract requirements. Some suppliers believe that residual will move up to about $1.50 a barrel on the Group 3 market.

Several indicators of a weak gasoline market were reported late in October and early in November. Bids to supply gasoline for the New York Port Authority in 1954 were considered low compared with normal posted tank-wagon prices. Most of the major gasoline marketers in Ohio cut tank-wagon prices 0.2 cent a gallon. This is a general cut and not a price-war reduction. Very little success has been reported in the several attempts to end some of the local price wars in the northeastern states. Gulf Coast markets are still soft.

There has been a small increase in up-the-river movement of distillate out of New York Harbor, but No. 2 is still available at 0.5 cent a gallon under the normal posting of 9.9 cents.

Some refiners in the Mid-Continent report increased movement of distillate both by tank cars and out of pipe-line terminals. However, most of the shipments are against contracts, and the increase is calculated from an abnormally low rate of movement in the last half of October.

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Prices East of California effective June 15, 1953. California prices effective February 16, 1953. Pennsylvania Grade prices effective September 21, 1953.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.05
Southwest Pennsylvania	3.61
West Virginia	3.55
Ohio	3.54
Illinois Basin	3.02

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FAILING model heavy duty 1500 drill and water truck. Write to Box 819, Longmont, Colorado, for details.

MODEL H Fort Worth Spudder. Most of tools from 10" to 6". Eastern Kansas Gas Co., Iola, Kansas. Telephone 81.

FOR SALE: 10,000'—4½" drill pipe, with tool joints cut off, located at Hobbs, New Mexico. Makin Drilling Company, Box 1628, Hobbs, New Mexico.

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16" OD API 5Lx42 E.W. Pipe. 1000 ft. New 52.36# .312" Wall Youngstown P.E. Pipe DRL. From Tulsa Stock. Phone or write

ARDUN SUPPLY CO.
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Phone 4-2405

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

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Available for immediate shipment. One lot of valves including angle, globe, gate, check and regulator valves. Especially adaptable for refinery and other industrial plant construction. Should be of interst to companies operating in foreign countries. An opportunity to save on construction or maintenance costs. All valves are of U. S. make from reputable manufacturers. For price and shipping information, write to:

T. J. BUTLER & SONS
Box 5065
Cristobal, Canal Zone

PACKAGED GAS DESULFURIZATION UNITS

All sizes for pipe line and fuel gas requirements.

WRITE—WIRE—PHONE

GRAFF ENGINEERING CO.
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Phone Justin 2153

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FOR SALE: Approximately 3600 ft. of 4½" 16.60# drill pipe with Hughes Flashweld extrahole tool joints. Model BC-6, 200 ton Emsco Swivel. Melton Supply Company, Box 1360, Seminole, Oklahoma.

FOR SALE: Failing Model 1500 drilling equipment. Have available for sale several drills exceptionally complete and in excellent condition. Particularly suitable for water well or deep core work. This equipment relatively new and now operating. Substantial savings possible. Box G-738, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: One complete Hydro Test Hydraulic tubing testing unit complete mounted on 1953 Ford Dual Truck. All in new condition. Box G-773, The Oil and Gas Journal, Tulsa, Oklahoma.

NOW WORKING—Portable workover rig on tandem trailer, complete. Cardwell K hoist powered by Waukesha GAK, 5 x 10 Gardner-Denver mud pump, Brewster block, Brewster OB-12 oilbath rotary, Cameron preventer, light plants, winch, trucks, pickup truck, house trailer. Inventory on request. $17,500.00. Box G-768, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: U-15 rotary rig like new, including trailer house fully equipped. Wonderful buy. Available only because of health. Now drilling in West Texas. Inspect while in operation to get better idea. H. W. Sullivan, 611 Gulf States Bldg., Dallas 1, Tex.

USED EXCELLENT CONDITION IN OPERATION

One Each (4¾" to 1") (8⅝" to 2⅜") (13⅜" to 4½") LANDIS Leadscrew Receding Head Pipe Threading and Cutting Machine Motor Driven.

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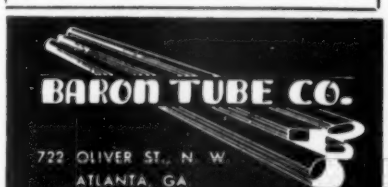
Phone CHarter 6914
P. O. Box 2589 Houston



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ATLANTA, GA

A SURE SOURCE OF SUPPLY AT ALL MARKET LEVELS FOR CASING, TUBING AND LINE PIPE. INQUIRIES SOLICITED.

EQUIPMENT FOR SALE

FOR SALE: At Bartlesville, one used Mayhew 1000 rig, purchased new in 1947 and mounted on 1½ ton 1947 V-8 Ford Coleman truck, engine #799-T 1547975, 3 speed auxiliary transmission ahead of rotary table, 3 speed Mayhew power take off, 4 wheel Coleman conversion drive, 8.25 x 20 10-ply tires all around, drill is chain pull down mechanical type, equipped with square Mayhew kelly, 4½" x 6" Gardner-Denver mud pump, 120' 2⅜" drill pipe with tool joints. Montana and Louisiana 1953 tags on unit. One spare tire. $6500.00. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE: FOUR Cardwell K-Model Pulling Units complete and in good operating condition; also ONE Cardwell Mobilhoist with spudding attachment, double-pole mast, drill and sand lines, with tools. All equipped with Waukesha Engines. JAMES OIL WELL SERVICE, Hobbs, N. M. Dial 3-2331. P. O. Box 2196.

Bargain Sale

Complete Ajax Engines

5—Ajax 10½" x 13", Type CMBG, Horizontal Single Cylinder, Two-Cycle Gas Engines, complete with all standard equipment, including horizontal shifting mechanism, less sheave and foundation bolts.

$2,000 each—f.o.b. Tulsa, Oklahoma

Bethlehem Supply Company
Box 2171 Tulsa, Oklahoma
Phone 5-9261—Ext. 343

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We own and are dismantling all the pumping stations on the original Humbolt to Chicago pipe line. We offer for sale at bargain prices diesel engines, pumps, steam engines and steam pumps. A. C. and D. C. motors, generators, and controls of all sizes. A large quantity of 6"—8"—10" and 12" valves and many other items too numerous to mention. Write or wire us stating type of equipment in which you are interested, and descriptive list will be mailed promptly. Address

SUMMER & CO.
3937 Main Street, Kansas City, Missouri
Phone Jefferson 6400

FOR SALE

25,000—6⅝" OD. Seamless, 18.97#, Range 2, beveled, clean inside and out.
50,000—3½" OD, T&C, Electric weld and Seamless, NEW, 6.50#
40,000—4½" OD, T&C, Electric weld and Seamless, NEW, 8.50#
Will rent, trade or sell. Bargain.

W. C. BERRY
Ph. 3-6141 Box 1858, Tulsa

EQUIPMENT FOR SALE

FOR SALE, near Maud, Okla.: One used erected 5,000 bbl. BS&B open top, flat seam bolted tank, used for fresh water. Price $1250.00. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

SULLIVAN 200—Mounted on New Tandem International, complete with all tools. For price and inventory contact—Fleming, 2216 Greenway Blvd., Wichita, Kansas. Phone 5-7717.

FOR SALE: 5—Shriver 42"x42" cast iron Filter Presses, Plate & Frame Type, 27, and 54 chambers 1" cake; 15—Sperry 18"x18" cast iron Filter Presses, 11 chambers; #12 Sweetland Filter for 72 monel covered leaves on 2" centers. Immediate shipment. Attractively priced. Consolidated Products Co., Inc., 17-20 Park Row, New York 38, N. Y. BArclay 7-0600.

71 STAR ON RUBBER. 1500 foot drilling sandlines. Tools, doghouse, winch truck, pipe, etc. $6,500.00. Phone Murray 2-0429. Write 521 South Junction, Muskogee, Okla.

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TWO 665 HP McINTOSH Seymour Diesel Engines, Type 4B44; 150 RPM; Used in Pipe Line Pumping Station. One recently overhauled with new crankshaft, etc. Oklahoma Iron and Metal Company, Ponca City, Oklahoma.

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10,000′ of 4½" Casing (11 lb.) @ .80. 900′ of 7½" Casing @ 1.10. 10,000′ of ⅝" Rods @ .125. 2" Lead Line in ground. Miscellaneous Fittings. 10,000′ of 2" Tubing @ .24. Equipment nearly new. Floyd Hubbard, Virgil, Kansas.

FOR SALE: 90 H.P. Twin Superior Compressor, Skid Mounted, Young Radiator & Intercooler. 11" x 5½" x 16". Extra 5½" Cylinder. Alfred B. Kern Company, 223 Wright Bldg., Tulsa, Oklahoma.

FOR SALE: Our Barnsdall, Oklahoma, warehouse, one Franks double drum, well servicing unit, skid type, with mast, mounted on 5 ton International truck, ¾" drilling line, ½" sand line, included. Price $2,000. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE: At our Stone gasoline plant near Burrton, Kansas, one used Model 6 WDH-5 BS&B gas dehydrator, Glycol type, New in '49. Cities Service Oil. Patridge, Bartlesville.

EVERYTHING in new and used equipment for well drilling. Fishing tools rented. Save money, get quotations from Pressey & Son, Pueblo, Colorado.

REDA PUMP complete w/#4—20 Motor, 45½ H.P., 650 Volt, 41.6 Amps. #90—Pump Housing. #5595—Switchboard w/recording Ammeter 3400′—#4 Cable 125 Amp. Auto Transformer Accessories. Engine 225 H.P. Climax Type R-225 on Skid. Alternator G. E. 125—KVA, 100 KW, 440 V. A. C. w/Transformer, Flexible coupling and skid base. House—10′ x 18′ wood frame, w/G.I. Roof and Siding on Skid. Engine—165 Hp. Climax R-61 on Skid. Herndon Drilling Co., 421 Mayo Bldg., Tulsa, Phone 4-9700.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

11,000′ 2" EUE 8rd. A1 Used Tubing. 8000′ 4½" Electrically tested Drill Pipe. 3000′ 3½" Drill Pipe. Used tubular goods available at all times. Phone 477, Giffin & Thompson Supply, Hoisington, Kansas.

FRANKS Double Drum Spudder mounted on 8-ton International converted from gasoline to diesel. Good rubber. Capable of drilling or tailing-in to 4000′. Now carrying 3500′ good ¾" wire. Mounted measuring line and meter. 53′ 10 to 8 telescope pole. Ready to drive away. Call or write R. L. Orr, 930 West First St., El Dorado, Kansas. Phone 1444, if no answer 591 Caney, Kansas.

EQUIPMENT FOR SALE

FAILING MODEL 1500—on contract with major client in Montana. Write for details to Box G-703, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: At our East Chicago refinery one used 300 hp. Type T2RA Moore steam turbine, 2250 RPM, SMT 150#, exhaust 15#, Serial #3991. Price $1000.00. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE: Two skid mounted 315 air compressors—One gasoline driven Ingersoll-Rand; other diesel driven Schramm. Priced to move. Walters Drilling Co., 4114 McMillan, Dallas 6, Texas.

EQUIPMENT WANTED

INTERESTED in buying good used flat belts. Also parts for Superior and Black Bear Engines, new or used. Texas Consolidated Oils, Box 656, Cement, Oklahoma. Tele. 2521.

NOTICE: We buy. We sell equipment everywhere. If you want to sell or buy, contact Pressey & Son, Pueblo, Colorado.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WANTED

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HELP WANTED

SEISMIC SUPERVISOR required by expanding and aggressive seismic contracting company. Should have ability to supervise any domestic area and have good professional contacts. Minimum requirements; college degree in geophysics or related fields and eight years' seismic experience. Good future. Tulsa location. Box G-705, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL Engineer — familiar with the design and manufacture of oil field equipment—experienced in machine shop and foundry operations. Administrative and sales ability helpful. Graduate preferred. Give full details of past experience, references, and salary expected. Replies held confidential. Write Box G-746, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED FOR EMPLOYMENT: Petroleum Engineer or Geologist with two or three years' experience in Louisina Gulf Coast. Duties will entail preparation and maintenance of detailed structure and isopach maps of south Louisina fields and evaluations necessary in field studies. Work located in New Orleans with reliable and financially strong concern. Reply giving age, experience in detail and salary desired. Inquiries will be kept strictly confidential. Our employes know of this ad. Box G-713, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERING GRADUATE wanted for fuel testing laboratory in Southern California. CFR knocktesting experience helpful but not essential. Working and living conditions excellent. Liberal employe benefits. In reply give age, background, salary expected, etc. P. O. Box 1199, San Bernardino, California.

EXPERIENCED COMPUTER wanted by established contract company. Degree in geology or related sciences helpful, but not essential. Salary commensurate with experience and ability. All replies held in strictest confidence. Include details of experience and education. Box G-769, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

EXPERIENCED SEISMOLOGISTS, Party Chiefs, Seismic Computers, and Observers by major oil company. Seismologists will be permanently located in Mid-Continent Area. Applicants should have geological and/or geophysical background or at least five years' practical experience. Give full details of education and experience in letter. Reply to Box G-760, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF CHEMIST experienced in Pod column work and gasoline plant process and product control testing to take charge of laboratory located at large gasoline plant in West Texas. Housing furnished and salary to be commensurate with qualifications of applicant. Please furnish experience record and salary expected. Our employees have been notified of this advertisement. Box G-776, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG.

SITUATIONS WANTED

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

LAND—LEASE—TITLEMAN—Licensed attorney well experienced in field and office with major company in Mid-Continent areas desires change to expanding independent production company. Location optional. Box G-750, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN—Title, Rental, Division Order and Utilization experience—6½ years with major oil company. Desires change to expanding independent. Now in Gulf Coast Area. Can relocate and travel. BS degree. Age 29. Box G-737, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST - GEOPHYSICIST, 20 years' experience Texas and New Mexico, some Williston Basin, desires connection Houston as office geologist or seismic interpreter. Adept at correlating seismic and subsurface data. Married, settled. References. Box G-767, The Oil and Gas Journal, Tulsa, Oklahoma.

QUALIFIED SECRETARY desires foreign employment. Preferably South America. 29, single, 10 years' diversified experience, including 2 years overseas and 4 years with major oil companies in Producing and Geological Departments. Box G-766, The Oil and Gas Journal, Tulsa, Oklahoma.

CONTROLLER-ACCOUNTANT desires to return to southwest. College degree, fifteen years' production and tax experience with two employers, public experience, handle taxes, unitizations, IBM application, budgets and administration. Box G-770, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, M.S., veteran, married, age 26, available in March 1954, wishes to work with company operating in Rocky Mountain Area. Box G-772, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING AND MUD Engineer, age 37, 17 years experience, 5½ years M.E. position domestic or foreign, Canada. Interested M.E. sales contacts all M.E. companies. Box G-775, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER and Geologist, 14 years with major oil company, having wide domestic and foreign experience in sub-surface geology, reservoir engineering and valuation. Box G-774, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE MAPS

DRY HOLE MAP OF OREGON, 42" x 72". DRY HOLE MAP OF WASHINGTON, 42" x 84". Price, $10.00 per map. Northwest Scouting Service, Public Service Building, Portland, Oregon.

ROYALTIES

DRILLING DEAL: 640 acres. Govt. Lease: Demand reliable operator, T. 18N—R. 84W—S10, Carbon County, Wyoming. Royalty Govt. 12½%, Me 3%. Francis M. Stoll, Higginsville, Missouri.

QUICK Cash for your producing royalties, over-riding royalties, and production. Robert Kinkaid, Post Office Box 26, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

WANTED—Settled oil production, approx. 1,500 bbl. per day, with proven acreage to drill. Give complete details in first letter. Be sure you can deliver. Stauffer, 108½ E. Grand River, Howell, Michigan.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

SEE A. L. Bowles, Rollow Building, Ada, Oklahoma, for drilling deals.

OIL & GAS LEASES, for sale to Highest Bidder. To November 21, 1953. Comprising nine thousand acres near production and drilling wells in Mountrail County, North Dakota. Write E. G. Ranum, Valley City, N. Dakota.

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EQUIPMENT MEN . . . in the News

Franklin Supply Opens Sales Office at Denver

Jene Harper, president of Franklin Supply Co., has announced the opening of a new district sales office in Denver, which will be under the direct supervision of Don Davis.

Davis, who has been with Franklin Supply for 5 years, has held sales positions in Mount Pleasant, Mich., Grayville, Ill., and Casper, Wyo., prior to his transfer.

Smith Made Manager of Koehring Export Sales

Koehring Co., of Milwaukee, has announced the appointment of E. A. Smith as vice president and manager of its two export sales subsidiaries, Koehring Inter-American Co. and Koehring Overseas Co.

Until his recent appointment, Smith was a sales engineer for C. S. Johnson Co., of Champaign, Ill., a Koehring subsidiary. Smith replaces R. E. Stewart who resigned recently.

Koehring's export branches handle sales of products produced by Koehring subsidiaries as well as those made by the parent firm.

BJ Service Announces Personnel Changes

John B. Merritt, executive vice president of BJ Service, Inc., has announced the following changes in personnel assignments: John L. Buster from the general office in Long Beach, Calif.,

Fluid Packed Pump Holds Division Manager's Meeting

Fluid Packed Pump Co. division managers recently spent a week at the company's plant at Los Nietos, Calif., discussing sales problems, becoming acquainted with new equipment, and touring the expanded plant and facilities. Attending the meeting were, pictured front row: Sidney Shuman, G. R. Newbolt, L. W. Crow, and L. B. Cook. Back row: Jack Clements, Harold Palmour, Glen Peters, C. D. Newbolt, and D. H. Vandenberg.

to Casper, Wyo., as Rocky Mountain division manager; Paul Whitaker has been transferred from sales engineer in Worland, Wyo., district to Casper, Wyo., as Rocky Mountain division sales supervisor; and Ralph Gilbert has been transferred from sales engineer in the Bakersfield, Calif., district to Worland, replacing Whitaker.

Buster replaces E. M. Syverson, who has been transferred to the Long Beach, Calif., office on special assignment. Whitaker replaces O. O. Luttrell who has been reassigned to the Bakersfield, Calif., district.

Knox B. Henderson On A.P.I. Program

"Future Development of Lease Storage Tankage" is the title of a paper to be presented by Knox B. Henderson, sales coordinator of National Tank Co., Tulsa,, November 10, at the American Petroleum Institute meeting in Chicago.

This paper, which will be given before the division of transportation symposium, will review briefly the general production methods which influence lease tank-battery installations. It will emphasize the importance of obtaining stable products at the tank battery and how different producing methods affect the volume of stable products offered by the producer to the pipe line.

Henderson is a graduate of Oklahoma A. & M. College with a civil engineering degree. Prior to joining National Tank, he was with Phillips Petroleum Co. in the general engineering department, and with the Philgas division in Detroit.

Alloy Steel To Display Corrosion-Resistant Valves

A full line of high-alloy corrosion-resistant valves of various sizes, types, and materials will be shown at the twenty-fourth Exposition of the Chemical Industries by Alloy Steel Products Co., Inc.

The various steps in the production of shell-molded valve castings will also be displayed on a background diorama. The use of virgin metals, induction-furnace molding, and the quality control of castings will be illustrated.

Valve specialists from Aloyco's corrosion engineering service will be on hand to discuss problems in the proper selection of valves for specific chemical processing applications.

Marlow Pumps to Merge With Bell & Gossett Co.

A. S. MARLOW, JR.

Marlow Pumps, Ridgewood, N. J., manufacturer of self-priming centrifugal pumps, merges as of December 1, 1953, with Bell & Gossett Co., Morton Grove, Ill., manufacturers of hot-water circulating pumps, universal pumps, heat exchangers, flow control valves, and other heating specialties. According to a recent announcement by A. S. Marlow, Jr., president, the joining of Marlow with Bell & Gossett makes the new combination one of the largest of its type in industry.

Under the new setup, Marlow Pumps will be known as Marlow Division of Bell & Gossett and will be headed by A. S. Marlow, Jr., as general manager. He will also be a vice president and a member of the board of directors of Bell & Gossett.

Garneau Co. Completes New Manufacturing Plant

A new manufacturing plant and office building that will produce cement-lined pipe for the oil and gas industry has been completed in Seminole, Okla., by Hughes Garneau Co., of Tulsa. President L. Hughes Garneau has announced. The Seminole installation is the sixth Garneau plant to be constructed in recent years.

Established in Tulsa 14 years ago, the Garneua company founded its first plant in Bartlesville, Okla.

Allis-Chalmers Assumes Operation of Buda Co.

Allis-Chalmers Manufacturing Co. has officially assumed operation of the Buda Co., 72-year-old Harvey, Ill., firm, according to W. A. Roberts, Allis-Chalmers president.

The addition to Allis-Chalmers will be operated as The Buda Co., a division of Allis-Chalmers. Ralph K. Mangan, with Buda for 36 years and president since 1950, will be in charge of the division with the title of president and general manager. Operating as a division of Allis-Chalmers, The Buda Co. will continue to manufacture, distribute, and service all items in its regular line of products.

Buda now produces 23 sizes of diesel engines and 20 sizes of natural-gas, butane, and gasoline engines, ranging from 5 to 516 hp. These engines are used in all types of application, principally in such industries as trucking, construction, and oil fields, and those industries using stationary and portable generator sets. Another major field in which Buda is prominent is the manufacture of earth-boring machines, used principally by utility companies, construction contractors, and highway departments.

With this new division, Allis-Chalmers now operates 16 factories, including 12 in the United States, 2 in Canada, and 2 in England. Other plants are located at West Allis and La Crosse, Wis.; Springfield, Ill.; La Porte and Terre Haute, Ind.; Norwood, Ohio; Pittsburgh; Boston; Gadsden, Ala.; Cedar Rapids, Iowa; Oxnard, Calif.; St. Thomas, Ont.; Lachine, Que.; Eling, England, and Essendine, England.

Dowell Announces Three Management Promotions

W. E. REARDON

Dowell Incorporated has promoted three top management personnel to positions of broader responsibility to streamline general office operations in Tulsa, according to A. C. Polk, vice president and general manager.

Director William E. Reardon was elected a vice president of the company by the Dowell board of directors. Director William J. Russell was named manager of equipment and supplies, another newly created company-wide position, and Charles E. Mangold, assistant general manager, was appointed manager of cost controls, also a newly created position.

W. J. RUSSELL

C. E. MANGOLD

Reardon joined Dowell in 1933 at Seminole, Okla., as a service engineer. In 1934 he became district manager of Dowell's Seminole district. He was promoted to assistant general manager and moved to the Tulsa general offices in 1937, and he was elected a director of Dowell in 1948.

Russell first worked for Dowell in 1934 as a service engineer in Louisiana and Oklahoma, and the same year

he was promoted to district manager of the company's former Tulsa district. He earned promotions in 1937 and 1938 as district manager of the Seminole, Okla., and Midland, Tex., districts. He was promoted to assistant general manager in the general offices in Tulsa in 1945, and was elected to the board of directors in 1949.

Mangold joined Dowell as a service engineer at Irvine, Ky., in 1932. In 1934 and 1935 transfers took him to Kansas, Louisiana, Texas, and Oklahoma as director of paraffin solvent sales for Dowell. He was then promoted to district manager of the Shreveport district. Mangold was appointed assistant general manager at Dowell's general offices in Tulsa in 1943.

Ballard Named Divisional Sales Representative

W. Paige Ballard has been appointed divisional sales representative for the Texas-Louisiana area of Exploration Surveys, Inc., Dallas.

Ballard is a graduate of Massachusetts Institute of Technology where he received his B.S. degree in mechanical engineering in 1937. Following World War II he served in the production engineering section of Atlantic Refining Co.'s producing offices in Dallas, where he helped to pioneer more efficient recovery techniques and cementing operations.

Lunkenheimer Announces Steel, Iron Valve Expansion

Facilities for producing steel and iron valves at its Carthage, Ohio, plant are being expanded to meet the growing demands for these products, particularly for steel valves, according to P. M. Arnall, president of The Lunkenheimer Co.

Steel and iron castings will be supplied to Lunkenheimer specifications by outside sources, which necessitates adjustment in the foundry working force and allows Lunkenheimer personnel to devote its full time and efforts to the production of steel and iron valves.

Du Pont Announces Increase In TEL Productive Capacity

The completion of a 14-per cent increase in tetraethyl lead productive capacity was announced recently by E. I. Du Pont de Nemours & Co., Inc. This marks a total increase in Du Pont's TEL plant capacity in excess of 100 per cent during the last 3 years. The company also stated that a further substantial increase in TEL productive capacity is under way.

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Imperial-McCarty & Coleman 16-23 Val Marie, LSD 16, 23-4-13w3. Dry. TD 5,397 ft.

ALBERTA

Cal Standard 7-6 East Acheson, LSD 7, 6-53-25w4. Basal quartz oil well. Plugged back to 4,100 ft. TD 5,660 ft.

Imperial 7-12 Fairydell, LSD 7, 12-57-24w4. Viking gas well. TD 2,803 ft.

Great Plains-Triad 2-10 Crowfoot, LSD 2, 10-20-18w4. Dry. TD 5,588 ft.

Baysel-Stavely 16-11 Syndicate, LSD 11, 16-14-28w4. Dry. TD 8,637 ft.

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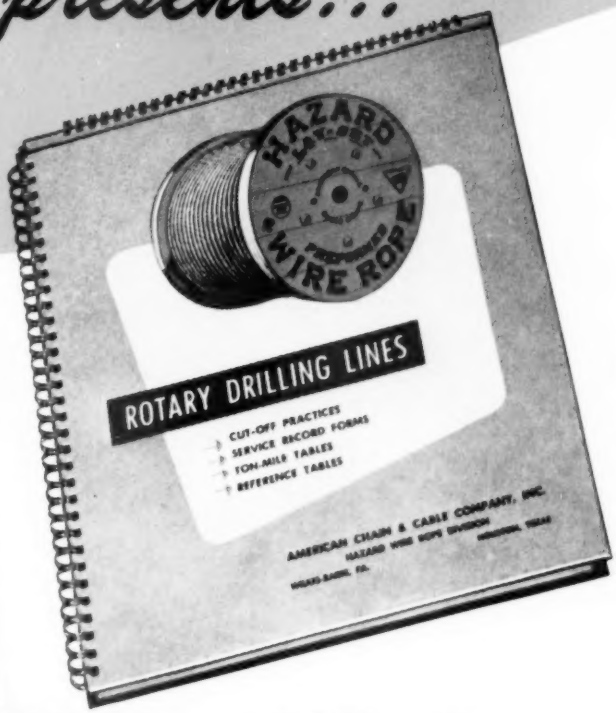

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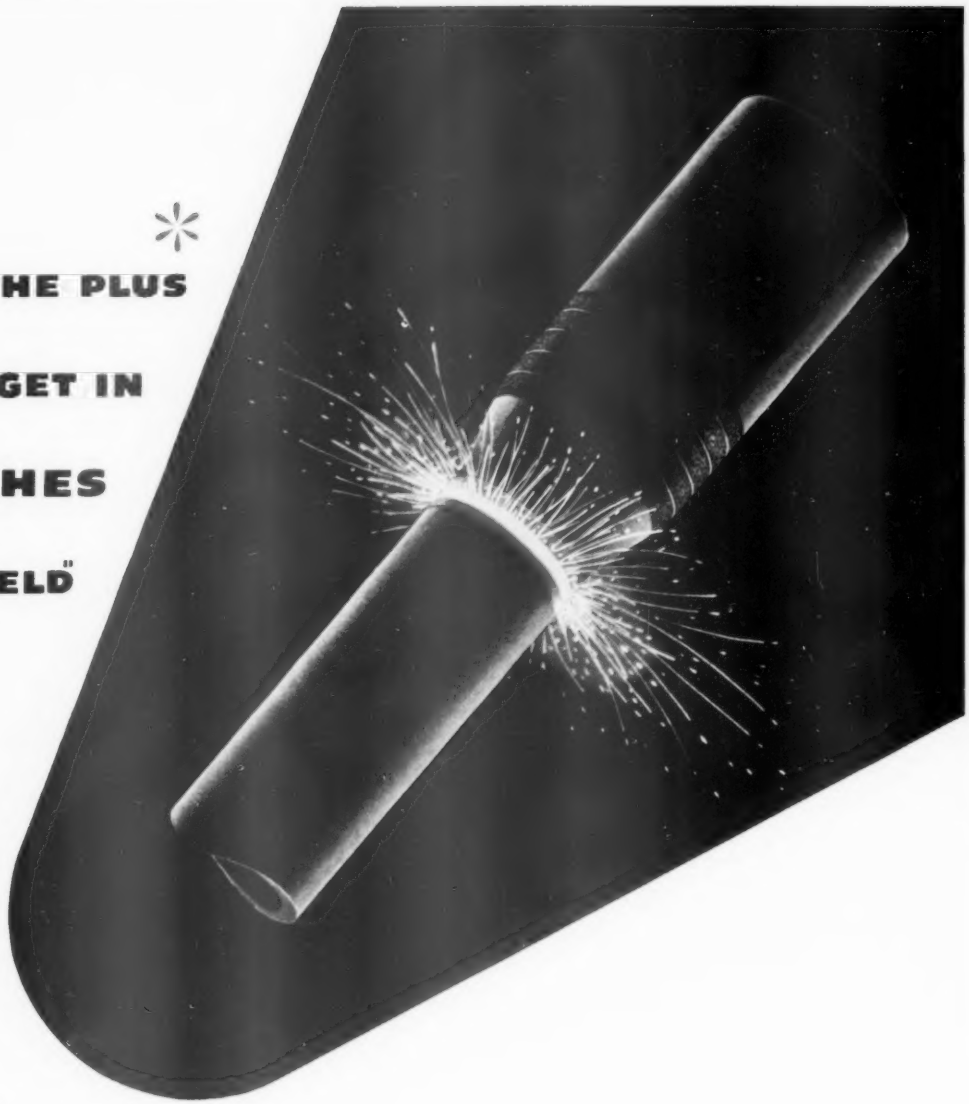

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